FLYING

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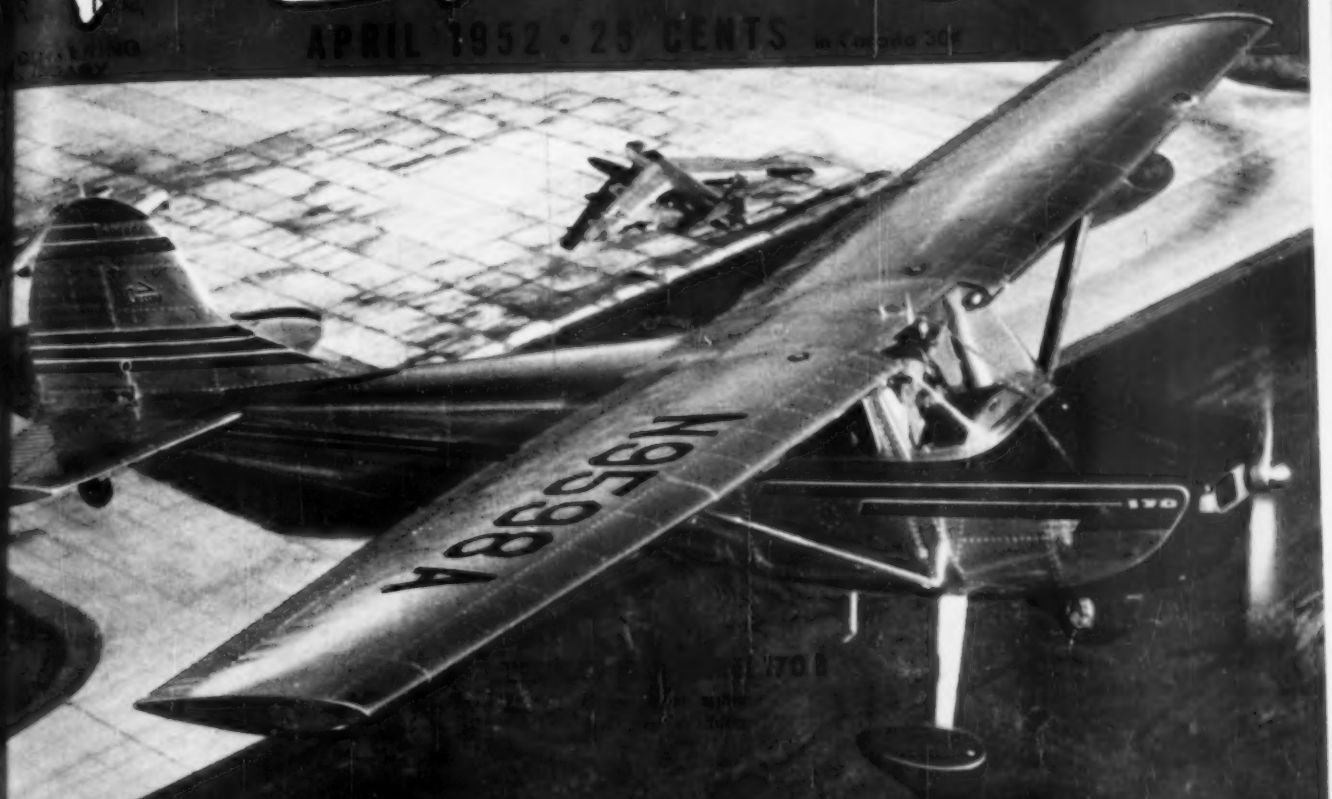

This Issue

TRACKING THE BIRD

Air Force Specialists Study Flying Missiles on Their Fiery Way Over Island Outposts

SPIRAL DIVES NEED AN Rx

PAGE 30

★ ★

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CESSNA CASE HISTORIES

CONTRACTOR

DAIL CONAWAY, Denver, Colo., owns an air heating and sheet metal business, reports he can bid on *and get* jobs 500 miles away by flying there in his Cessna 170. He flies his mechanics, too—saves wages he'd ordinarily have to pay them for traveling. Other uses of Conaway's 170: visit his Casper, Wyo. office, his family in Kansas, suppliers in Iowa. Conaway says Cessna's all-metal construction is "good insurance against hailstorms," also praises his 170's high-altitude performance, visibility, economy.

LOAN AGENT

A. BRADY DE VORE, North Platte, Nebr., a small loan and insurance salesman, co-owns his Cessna 170 with a friend in the Title Abstract business. De Vore is a director in the Nebraska Small Loan Assn., flies to meetings in Norfolk, Grand Island and Omaha. Says he also uses his plane to appraise property, scout prospective clients, negotiate and manage small loans as far away as Denver. De Vore learned to fly his Cessna in 13 hours, says the plane is one "we definitely could afford and find completely satisfactory in all respects." It is the second Cessna for him and his partner.

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ZIFF-DAVIS PUBLISHING COMPANY

FLYING

Reg. U. S. Pat. Off.
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VOLUME 50 • NUMBER 4

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Editorial and Executive Offices, 366 Madison Ave., New York 17, N. Y.

FLYING is published monthly by the Ziff-Davis Publishing Company at 185 N. Wabash Ave., Chicago 1, Illinois. Entered as second-class matter Sept. 8, 1942, at the Post Office, Chicago, Ill., under the act of March 3, 1879. Entered as second-class matter at the Post Office Department, Ottawa, Canada. *Postmaster— please return undelivered copies under form 3579 to 64 E. Lake St., Chicago 1, Ill.*

SUBSCRIPTION RATES: U.S., Canada, Mexico, South and Central America and U.S. Possessions, $3.00 for twelve issues; in British Empire, $4.00; all other foreign countries, $4.00 for twelve issues. SUBSCRIPTION SERVICE. All communications concerning subscriptions should be addressed to Circulation Dept., 64 E. Lake St., Chicago 1, Ill. Subscribers should allow at least two weeks for change of address.

CONTRIBUTIONS: Contributors are advised to retain a copy of their manuscripts and illustrations. Contributions should be mailed to the New York Editorial Office and must be accompanied by return postage. Contributions will be handled with reasonable care, but this magazine assumes no responsibility for their safety. Any copy accepted is subject to whatever adaptations and revisions are necessary to meet the requirements of this publication. Payment covers all author's, contributor's and contestant's rights, title, and interest in and to the material accepted and will be made at our current rates upon acceptance. All photos and drawings will be considered as part of the material purchased.

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LOCKHEED

SUPER CONSTELLATIONS TO GET TURBO-PROPS

The U.S. Navy has selected the new R7O-1 Super Constellation as ideally designed for vital conversion to turbo-prop power. Only minimum modifications are required, according to BuAer. No structural changes of the empennage, fuselage or basic wing are necessary.

Significance to airline operators is that Super Constellations with Wright 3250-h.p. compound engines can later be converted to turbo-props. This conversion to Pratt & Whitney T-34 Turbo Wasp engines will put the Super Constellation in the 450-mile-per-hour-class.

The Super Constellation offers any airline operator any performance he desires, from high-density coach travel, to luxury over-ocean travel, or it can be used for efficient, economical cargo purposes.

Never before has the basic structure of any aircraft provided so adequately for *growth*, assuring the operator many years of competitive performance. Compared with any of today's certificated aircraft the new Super Constellation is superior in versatility, speed, payload, range and ability to earn greater profit.

NEWS NOTES FROM LOCKHEED

Eight international airlines have now ordered Super Constellations—most recent: Seaboard & Western Airlines and Braathens S.A.F.E. Air Transport . . . With Navy and Air Force orders, the total demand now exceeds 200. . . . A new "White House Squadron" of Lockheed F-94 All Weather Jet Fighters is guarding Washington, D.C. . . . Lockheed is occupied with aircraft using six different kinds of power, including reciprocating engines, turbo-props, jets and rocket power. . . . For pilot comfort every Lockheed jet fighter has a cockpit cooling system equivalent to 100 household refrigerators. . . . The single Allison jet engine in the Lockheed T-33 jet trainer is more powerful than all four engines of the B-17 bomber of World War II fame. . . . Pilots of many nations learn jet flying in Lockheed T-33 trainers, and recently when two T-33's were delivered to Turkey they were inaugurated in preflight Mohammedan rites including a lamb sacrifice.

FROM THE WORLD PRESS

Under the headline, "New Facts on Jet Combat," *Aviation Week* reports from Tokyo: "The Lockheed F-80 *(Shooting Star)* still is considered to be the best ground-attack jet in Korea. There is considerable belief here that development of an airplane along the proved lines of the F-80 is the answer to the interdiction-close support requirement." Thus another Lockheed design continues to prove its basic "rightness" even though more modern types have replaced it in Lockheed's production line.

MILITARY NEWS

CARGO-TANKER CONVERSION SHOWN

. . . **In seven hours** and 15 minutes, a KC-97 *Stratofreighter* was changed from a tanker to a cargo ship. This record was surpassed the next day when the same ship was reconverted in even less time—five hours and 36 minutes.

This all took place recently during a special demonstration staged in Seattle at the request of the USAF.

Setting a record in tanker-to-cargo conversion, it took four hours and 40 minutes for the functional check and adjustments of the tanker equipment. The plane was completely ready to fly in its new guises exactly ten hours and 16 minutes after the demonstration started.

A total of 32 men participated at the peak points of the conversion and the entire operation called for 164 man hours. The functional check on the tanker equipment took 23.5 man hours.

NAVY ATTACK BOMBER

. . . **The Navy's turbo-prop carrier-based** attack bomber, the North American XA2J-1 *Savage*, was successfully flown for the first time recently.

Test pilots Robert Baker, and Charles Poage flew the experimental bomber for 32 minutes before setting it down on the desert runway at Edwards AFB, Calif.

Baker reported after the landing that it was a very satisfactory flight. "It has a lot of power and speed—just what it needs for carrier operations," he stated.

Powered by two Allison T-40 turbo-prop engines turning six-bladed counter rotating Aeroproducts propellers, the new *Savage* has a top speed in excess of 400 m.p.h. Somewhat heavier than its predecessor, the AJ-1 *Savage* which is now in fleet operation, it also has greater tactical range. It has a miximum take-off gross weight in excess of 26 tons. The wing span is over 70 feet with a comparable length. Wing tips fold inward and the vertical stabilizer downward for easy carrier storage. It has tricycle landing gear and standard Navy arresting equipment for carrier landings.

Capable of carrying a bomb load of 10,000 pounds, it has 20 mm guns as armament. The plane carries a crew of three in a pressurized cockpit.

NEW JET SIMULATOR

. . . **The Navy** has increased its striking power with a new-type carrier-based jet fighter that can be flown at altitudes of over 400,000 feet on all kinds of missions —without leaving the deck of the ship.

Designated the 2F9, this new stationary flight simulator has been developed by the Curtiss-Wright Electronics Division in cooperation with the U. S. Navy. In it, pilots can perfect flying and combat efficiency under the close observation of skilled instructors under way at sea in all kinds of weather.

The cockpit of the 2F9 is a replica of the *Banshee* twin-jet fighter with one exception—the windshield is opaque.

ROCKET NEWS

. . . **Very shortly, The Glenn L. Martin Co.** is hoping to make another assault on the world's altitude record for single-stage rockets.

The forthcoming *Viking* will be somewhat different in appearance than its predecessors. Martin has redesigned No. 8, with the cooperation of the Naval Research Laboratory, so that the rockets will be greater in diameter, slightly shorter and have fins about three-quarters the size of the first seven.

The advantage of the new size is that it will allow more fuel to be carried—both liquid oxygen and alcohol. Providing thrust for a longer time, consequently the rocket attains higher speed with greater altitude. The powerplant generates approximately 20,000 pounds of thrust.

The present world mark, established

(Continued on page 40)

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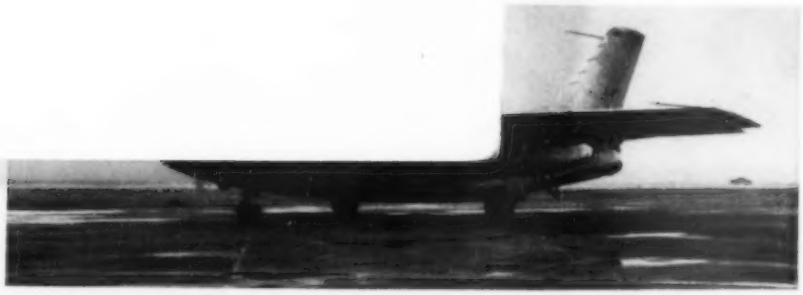


FLYING
VOLUME 50, NO. 4
APRIL, 1952

AN EDITORIAL

AMERICAN AVIATION is uniquely sterile of public affection. Airports rate high in nuisance value, private flying sparks no community pride, aircraft industry and commerce are whipping boys, military aviation is never free of sniping.

These conditions endanger security and take the profit and incentive out of aviation business. They suffocate creative genius and put costs of participation beyond the pocketbook of youth. They reduce the influence of the United States in world affairs.

Two remedial steps are necessary. First, American aviation must close up its own ranks. Second, public understanding of the entire picture of aviation must be broadened. Until these steps are taken no phase of aviation can truly realize its potential.

Aviation once enjoyed great popular esteem. Everybody pulled together. Private flyers were apostles of air industry and commerce. The manufacturer and the airlines boosted for the little fellows, and shoulder to shoulder all fought for air defense.

The American people understood that kind of spirit. It reminded them of the pioneers who built the country. They cried, Ride 'em cowboy, and cheered as we battled the high frontiers.

The frontiers yielded in important respects. As we began to win we lost sight of common objectives and drifted apart. The idea crept in that the aircraft industry had but one customer . . . government. By "government" we meant a handful of procurement officers, forgetting that if we had but one "customer" the "customer" more surely had us.

Many also began to say that it no longer was necessary to sell aviation. We forgot that even the Ten Commandments still require salesmanship, as do such precious packages as human freedom and the golden rule. "No show" reservations cost the airlines millions of dollars. Any run of tough luck temporarily emptied airline seats like a plague.

As private flyers, we failed to carry our communities along with us. We buzzed and annoyed and ridiculed till they wanted no part of us. Kids stopped coming to airports and flying schools closed up. Lightplanes grew expensive and storage costs soared beyond reach of the poor man.

Research has been turned on and off like a light. Aircraft development is five wasted years behind. The industry has about as much free enterprise as a trained seal. Airlines need specialists who can read politicians better than route structures and balance sheets. Whereas the American people once felt we had world supremacy in aviation they now doubt the claim.

Because we failed to carry public understanding of aviation along with development we lost backing. What always happens to any force removed from popular affection happened to aviation.

Can this condition be changed? Can the ranks of aviation answer the challenge of unity and the American people be brought once more into active partnership with their aviation representatives?

FLYING believes, "yes." We hold it mandatory to the future of the United States that the private pilot and aircraft owner, the aircraft industry and airlines, the school operators and airport managers close up ranks and together so serve and sell the American people as to merit the affection and understanding which alone can assure security and prosperity.

This will not happen by accident. It will happen only because Barkis is willin'. That means all of us.

Gill Robb Wilson

Gill Robb Wilson
Editor & Publisher

TRACKING the "BIRD"

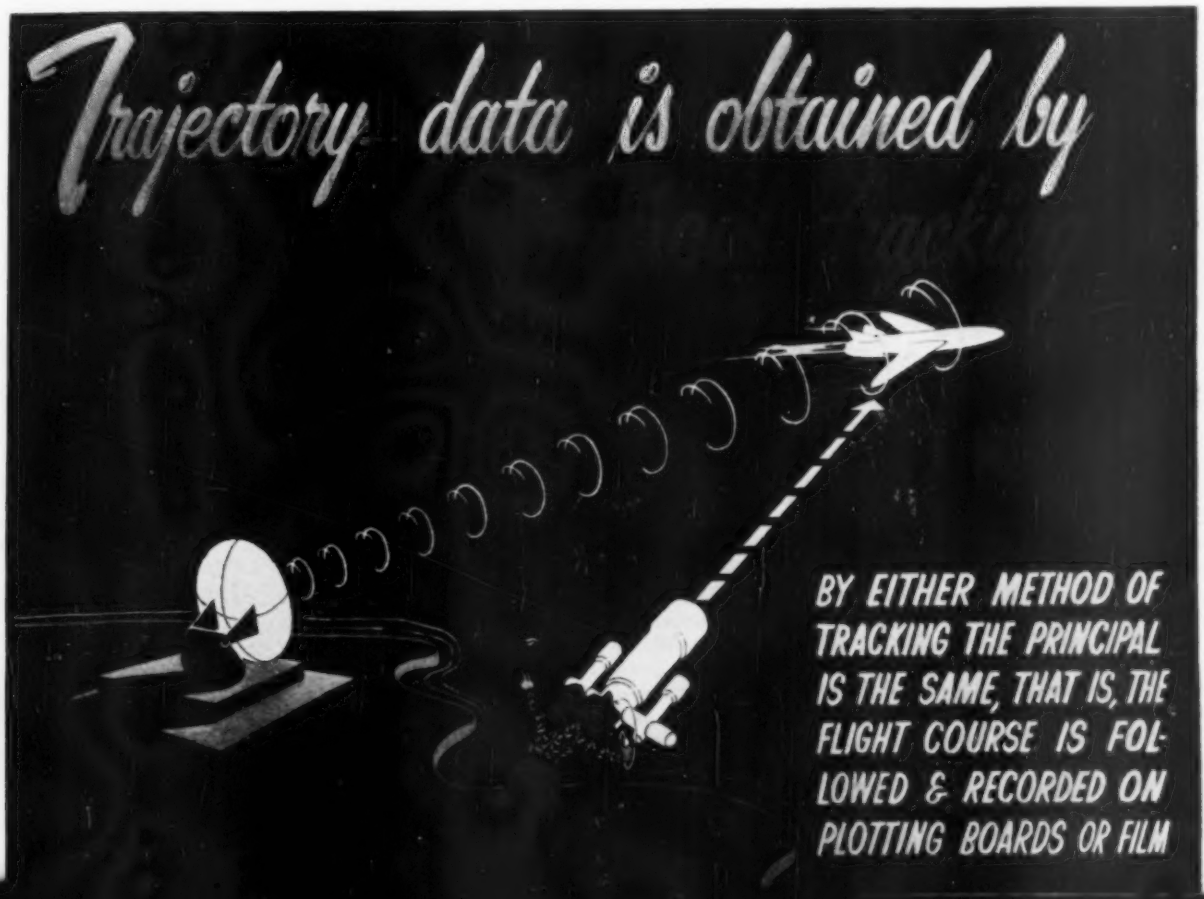
It's the job of the Air Force Missiles Training Center to observe the missiles' progress via radar.

"I HAVE THE 'bird'," exclaims a radar operator who is busily making adjustments and keeping an attentive eye on a small blip of light on the radar scope. A "bird"? This is the jargon for guided missile, according to the missileers. Seen from where? On a remote and barren island in the Atlantic Ocean off the east coast of Florida.

Such a scene is typical of one of many instrumentation tracking stations—three are in operation now—of the Air Force Missile Test Center of Cocoa, Fla. AFMTC is the recently-organized missile flight-testing facility of the USAF Air Research and Development Command. Organizationally it is at numbered air force level.

A dual-purpose mission has been assigned to AFMTC: (1) to provide a proving ground and in-flight performance data for the many guided missile manufacturers, which includes missile assembly shops, equipment, and a launching area, and (2) to train military personnel in the handling and launching of missiles, such personnel to be formed into squadrons for later tactical assignments.

It was only a scant six years ago when this enormous "outdoor laboratory" was conceived in Washington, D. C.

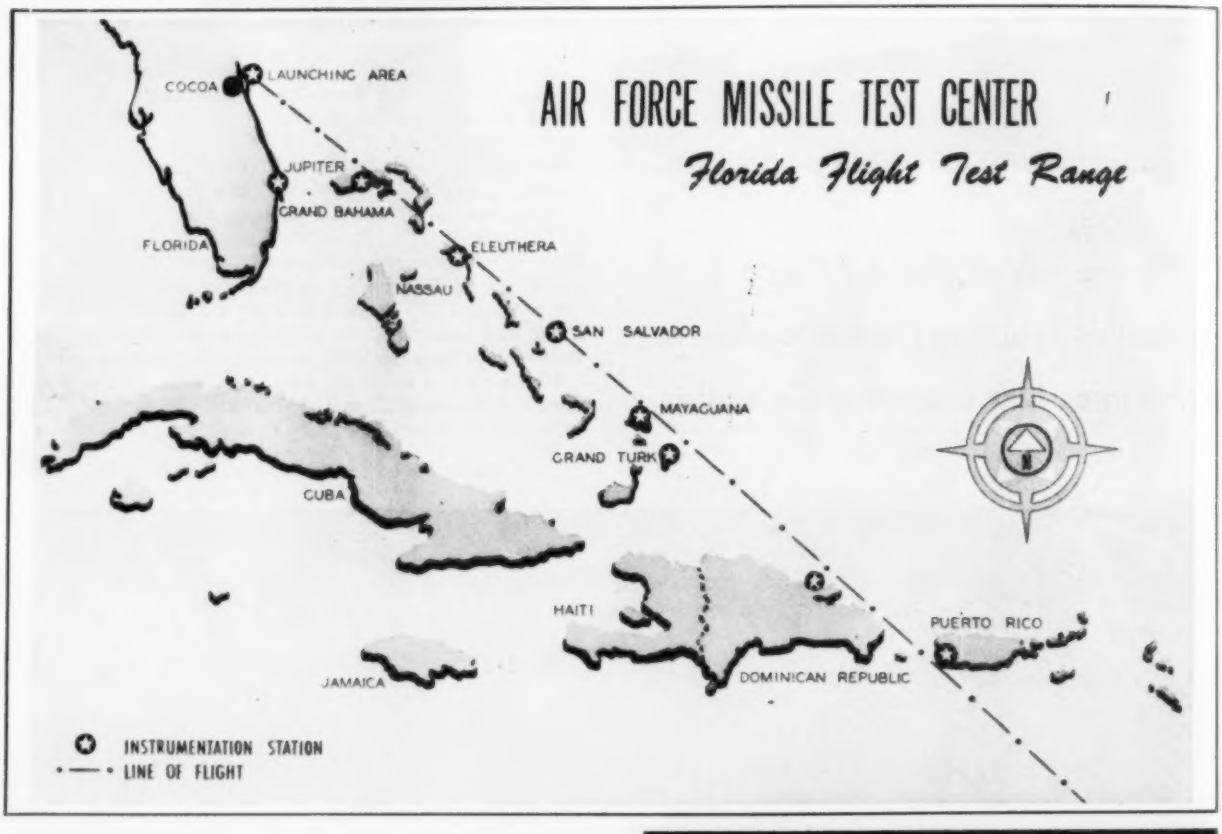

Trajectory data is obtained by
BY EITHER METHOD OF TRACKING THE PRINCIPAL IS THE SAME, THAT IS, THE FLIGHT COURSE IS FOLLOWED & RECORDED ON PLOTTING BOARDS OR FILM

A typical Instrumentation Station consists of
A COMPLETE RADIO & WIRE COMMUNICATIONS CENTER
A RANGE SAFETY CENTER FOR RANGE CLEARANCE & IN-FLIGHT SAFETY
A WEATHER FORECAST & RECORDING STATION
A TELEMETRY RECORDING STATION
A RADAR & OPTICAL TRACKING CENTER
LIVING QUARTERS FOR TECHNICIANS
AND - A LANDING STRIP FOR AIRCRAFT OPERATIONS

toured the Cape recently, remarked, "This isn't the Canaveral I knew two years ago. Why, it reminds me of the Florida real estate boom days in the twenties!"

Buildings of all descriptions are being rushed to completion, launching control blockhouses are ready, additional launching pads are under construction, antennas of all shapes and heights spring-up over night, access roads are seen in all directions, many of which provide permanent camera mounts, radar "dishes" dot the horizon, all of which add to the invasion of one of nature's former land wastes of palmetto scrub, wallows, sand, and mosquitoes.

Cape Canaveral Auxiliary Air Force Base—all tracking stations are auxiliary AFBs named after the locality in which they are located and are manned by numbered missile test squadrons—performs three main functions: launches the missile, tracks it for position, and receives its performance data. The latter two functions are responsi-



A Long-Range Proving Ground Committee, headed by Brig. Gen. (now Major Gen.) William L. Richardson and currently AFMTC's commander, had spent many months planning and site-selecting. The aim was to find a site where long-range missiles could be safely flight-tested over an almost limitless range. Cape Canaveral, halfway between Miami and Jacksonville, Florida, was finally chosen because of the ideal all-year climate, location of the nearby Bahama and Caribbean Islands for tracking station sites, availability of a virtually isolated area for missile launchings, and location of the nearby deactivated Banana River Naval Air Station. This latter could be used as a base facility and thus represent a resultant saving of approximately 20 million dollars otherwise necessary for new base construction.

Today, technology has made its imprint at Canaveral. In fact, a former long-time resident of the area, who

bilities of the other eight auxiliaries, or down-range stations as they are commonly known.

Three to four hours before X time, or the scheduled launching time, an operation called "range clearance" is conducted to clear ships and aircraft out of the range danger area, an area in which vessels might be endangered by an erratically-behaving missile and the final impact point. Radar-equipped B-29 *Superfortresses*, flying throughout the range, continuously sweep the shipping lanes with their radar "eyes." As soon as a target is observed by the radar operator, the position and course of the ship is radioed to the Range Clearance Officer who plots the information on a chart. New position reports are changed accordingly as they are received.

If it is determined that the ship is in a potential danger zone and will not clear it prior to X time, a "Polly Plane" is informed by radio of the situation. This aircraft, being a C-45 or C-47, is so-named by virtue of its ability to speak like Polly the parrot. Equipped with a loud speaker in the rear fuselage section, the pilot, by flying low over a ship, can speak to the ship's skipper, warning him of the impending danger. A new course for a certain period of time is recommended. Of course, compliance is not mandatory, the ship being free to proceed as before. However, from past experience, it has been found that most ships follow the recommendations.

Several amusing incidents have occurred during range clearing operations. Recently a Norwegian freighter that was contacted could not understand English and the Polly Plane pilot could not speak Norwegian. His point was put across finally by communicating via international Morse code, using a blinker light.

At the other extreme, heavy sealane traffic has presented problems of concern. The Gulf Stream, plying northward at an average speed of two to three knots an hour and crossing the range diagonally about 30 miles offshore, is used to advantage by a great number of northbound ships. Prior to one launching, a total of 25 ships of varying size had to be positioned. Although every attempt is made to adhere to a launching schedule, the "birds" will be held until the range is declared safe.

Air surveillance is accomplished by a search radar which scans the skies for air traffic. The presence of aircraft in the range area, however, is not as critical a problem as that of surface vessels, an aircraft's speed enabling it to soon clear the confines of the range. But because of the possibility that as soon as one aircraft leaves the range another might be entering, constant watch and position recording must be maintained. If necessary, aircraft are warned by radio communication. And as a further precaution, notices to airmen and mariners are posted well in advance of all missile launchings, indicating the hours and days of operations and the danger area coordinates.

Then, just prior to X time, providing that all surface and aircraft plotted positions so indicate, the Range Clearance Officer announces, "The range is safe." Launching control jumps into action.

Final check-out of the missile's many systems is accomplished, performance data instrumentation transmissions are checked by ground receiving units, fueling is finished, guidance control is o.k., destructor elements are installed, all personnel are cleared from the launching pad area, tracking radars are aligned on the "bird" with modified manually-controlled gun sight directors, and down-range stations are alerted for readiness.

The time is X minus one minute. Last-minute coordination continues. Fewer and fewer okays are heard over the vast communications net. X minus 20 seconds. Cameras start to grind. The In-Flight Safety Officer, who assumes control immediately after take-off, is anxiously awaiting the first movement of the pen recorders on his plotting boards. Crescendo of the missile's engine blast is easily discernible as it nears full power.

X-10 seconds, 9, 8, 7, 6, 5, 4, 3, 2, 1, Fire!

Tons of pilotless aircraft dart forward spitting flame and smoke with unbelievable velocities. Flying speed is reached instantly, tremendous power having been supplied by a rocket booster. Seconds later the booster unit has dropped and the "bird" is on-course under its own power.

Operators of the radar gun-sight directors have not been idle. Cautiously they follow the missile as it leaves its roosting place, keeping it centered in their sights at all times. When manual control reaches its maximum and a firm fix is confirmed, control is switched to automatic tracking. The radar beam is now "locked" on the missile. Sudden twitches are noticed in the huge SCR-584 radar dishes as the system periodically re-aligns itself on the target.

Meanwhile, a group of officers and airmen stand huddled around illuminated plotting boards in the operating room of Central Control, the "brains" of the entire operation. Small pen recorders slowly inch their way along charts of the "bird's" pre-determined course. Deviations in azimuth and elevation are instantly recognized—radar impulses travel at a speed of 186,000 miles per second, the delay between transmission and receiving of the reflected pulses being measured in micro-seconds (a micro-second is one one-millionth of a second).

A good percentage of the "brains" sits within this very room in the form of a large black box. In fact, it is so brainy that it has had about $170,000 of schooling crammed into its steel skull. Called a computer, it receives the reflected radar signals, jumbles them around a circuit of massed electronic vacuum tubes and relays, and then shoots them to the plotting boards, again all in a matter of micro-seconds. All this just to draw an inked line on a map!

To the In-Flight Safety Officer this represents a lifeline, one that determines whether or not the missile will endanger life and property. Although the plotting boards offer valuable technical information, the matter of safety is an important one and is given high priority in the entire missile flight-testing program.

As the "bird" progresses speedily down-range, the IFSO closely scrutinizes the wake of the pen recorder, interpreting its every move. No one interferes. It just isn't allowed. Once a missile is on its way, the IFSO is absolute boss. The job calls for quick and exacting decisions, no time for consultations with brother colleagues. Cool, calm, and collected Major Albert H. Grinsted, Jr., performs this important job at Cape Canaveral.

All this while, other tracking (*Continued on page* 52)

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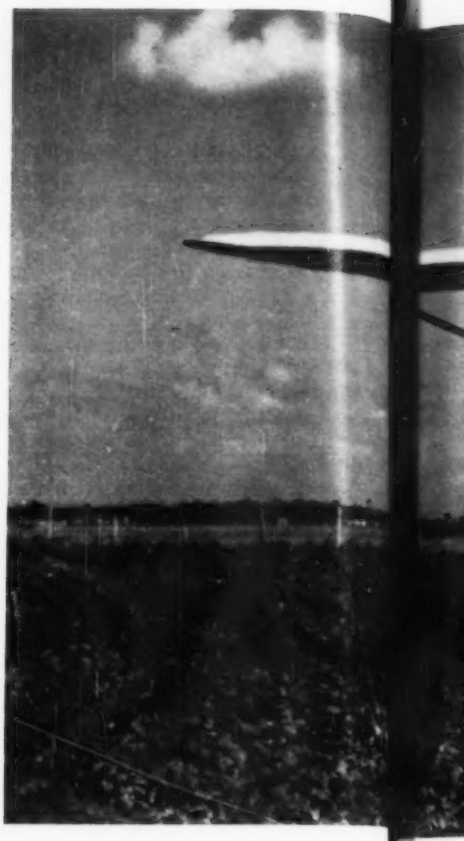
Five expert duster pilots assisted our check pilot in his analysis.

The Agricultural "CUB" PA-18A



EDITOR'S NOTE

FLYING's CHECK PILOT

This series of articles is planned to help the pilot and prospective plane owner evaluate aircraft now on the market. Only aircraft holding a CAA Type Certificate are flown. The authors evaluate each aircraft through the eyes of the average private pilot who flies a plane for business or recreation.

The spray rig has 2 suspended booms on which are 24 nozzles and it features a spray quantity gauge and pressure regulator control.

Fuselage has been considerably modified to contain very large hopper. Its capacity is double the amount of previous outfits.

By ED HOADLEY

THE ARMED FORCES THINK crop dusters are pretty special people so they give them special consideration for draft deferment. Piper Aircraft also thinks crop dusters are special, so it has built a special airplane to do the special job that makes our national crops bigger and better.

That new airplane Piper is building for crop work is a specially modified *Super Cub* that combines the necessary characteristics of a field work-horse with the stability and safety commonly associated with Piper products.

I was lucky to have Howard "Pug" Piper ask me to check fly the airplane, and then deliver it to a group of professional dusters for evaluation. That was a good break since I was able to combine a checkout on the new Piper with an opportunity to see professional dusters put

Five skilled duster pilots put the PA-18A through its paces and all were especially enthusiastic about its terrific reserve power.

the airplane through its paces. Thus, this article represents an opinion cross-section of six check pilots, not just one.

Starting procedure was simple. I flipped the two switches—mixture full rich—and pressed the starter button. The 125 h.p. Lycoming caught right off. Taxi visibility is good on this model because of the low flat nose. In normal sitting position, I was able to travel down the taxi runways at Opa Locka airport without S-ing, and could see the concrete 50 feet in front. After a short wait for some planes to clear for the annual Miami-Havana Flight, I set the brakes, ran the tachometer up to 2,500 r.p.m., and let her go with flaps one-half down.

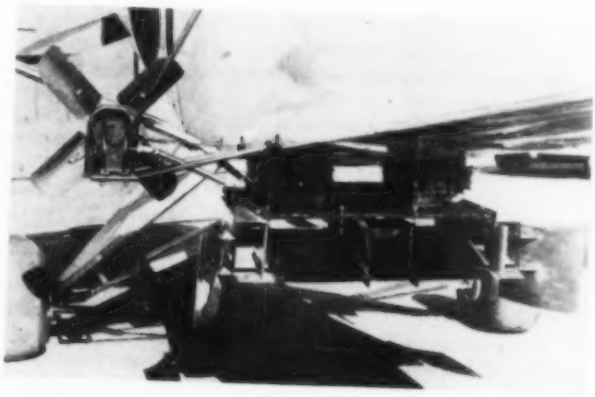
On the first take-off, I raised the tail way up. It took a measured 150 feet to become solidly airborne. I had had no instructions of any kind on the technique of handling this plane. Howard Piper, upon being questioned, said: "Ed, there are no unusual characteristics on the *Super Cub*. Just fly it."

On the second take-off, I set the heel brakes again, but this time left the flaps up. The tail came up immediately. Then, as she gathered speed, I pulled half flaps. This run measured 126 feet. On the third try, I raised the tail way up but used no flaps at all on the take-off. This run took 165 feet. On the fourth attempt, I left the tail down with half flaps, and let her fly herself off. I held my hands off the stick. She came off steady at 180 feet. The fifth attempt with half flaps, tail just barely raised off the runway, gave a distance of 174 feet.

I learned later that best take-off technique is to run up engine full speed holding brakes, flaps up; then after flying speed is almost attained on the take-off run, apply full flaps. This is more effective than application of half flaps.

The load in all these take-offs consisted of a hopper partially filled, two wing tanks filled with 36 gallons of gasoline, a Speed Graphic camera in the baggage compartment, and my weight of 145 pounds. Temperature was 80°, with a northerly wind of 15 m.p.h. The airport was almost at sea level elevation.

I shot three landings and each time applied brakes as hard as I dared. The airplane showed no tendency to nose over and came to a stop in an average of three plane lengths each time. Not being too familiar with the plane, I hesitated to pull it in too close to the high fence boundary so had no accurate barrier land- (*Continued on page* 41)



Double-gated venturi with lateral flow dispersal plates, plus flaps, gives deep, penetrating coverage in a very wide swath.

AIRCRAFT PRODUCTION:

Problems and Answers

What about aircraft production? Progress? Headaches? To foster public knowledge of the problem FLYING presents an interview with Harold R. Boyer, Chairman of the Aircraft Production Board of the Defense Production Administration. Questions for the interview were prepared by FLYING's editorial staff and Advisory Board, and represent queries most often directed to FLYING by readers.

Q. What are the functions of the Aircraft Production Board?

A. The Aircraft Production Board functions basically as a staff organization. The *selection of contractors and the procurement of material is entirely in the hands of the Military* and only on extremely rare occasions do we counsel with them in regard to these functions. When we do, it is usually in the realm of fitness or ability on the part of the contractor to perform.

By definition, the Chairman of the Aircraft Production Board is charged with the responsibility for the central direction of the aircraft production program. The Board has responsibility for the overall coordination of the program and determines through established agencies, the total requirements, including military, commercial and civilian, for aircraft, and *recommends the allocation of the available supply of production resources for the aircraft production program.*

Q. What is the most important accomplishment of the Board?

A. This may seem off the beam, but our *most solid accomplishment is the teamwork* that has developed in the past few months *between the military services and civilian Government agencies.* The Aircraft Production Board has served as a focal point through which all the groups concerned with aircraft production can work to iron out difficulties and speed up plane production. This teamwork has made my own job easy, and I know that it is going to pay great dividends to the program in the years ahead.

Q. How large a staff does the Aircraft Production Board have?

A. That's a good question—and hold your hat! As a citizen and a taxpayer, I'm in favor of using to the maximum extent existing agencies rather than building up a large staff here in the Defense Production Administration. As a result, the *Aircraft Production Board staff consists of less than a dozen.*. Incidentally, most of the men are engineers and specialists.

Q. In which area are production problems most serious?

A. That's easy! *Engine availability is the basic limiting factor in plane production.* Generally speaking, the airframe plants built during World War II are available and are adequate for the program. On the other hand, the *plants in which the automotive industry built the major share of the power plant requirements during the recent war are not available because they are still being used to house the production facilities for automobile production.*

Too many people have the mistaken idea that a fifty per cent reduction in auto production automatically releases a comparable floor area and number of machine tools. Many components of most automobile engines in high production are produced on multi-station and transfer-type machine tools designed to perform a series of precise machining operations. These machines are highly specialized and completely inflexible as far as adaptation to any operation other than the one for which they were originally designed. This great line-up of machines is necessary whether ten or ten thousand pieces are put through the system daily.

Due to these single purpose characteristics, *a mere 25 per cent of automotive machine tools in the mass production auto engine plants found their way into aircraft engine production after complete cessation of auto production. It will even be less in the event of an all-out emergency due to the difference in construction between the piston and jet engines,* the latter type now constituting the majority of our program.

A great many of the government-owned universal type machine tools were sold, donated to schools and colleges or otherwise disposed of at the end of the late war. *Of the thousands which were retained, far too few were adaptable to the manufacture of the jet engine* or the working of metals in conjunction with the manufacture of modern sub-sonic and trans-sonic aircraft. *This fact was realized too late* in time to phase the build-up of the machine tool industry with the early stages of the defense program. Machine tools became the limiting factor in the acceleration of engine production, it still is and will continue to be so for some time in the future.

Q. Why is aircraft production so low now—almost two years after the fighting started in Korea—compared to the same stage in World War II?

Pilot, personal plane owner, industrialist, Harold R. Boyer brings to his position a long and intimate knowledge of American aviation. He has logged 3,500 hours solo flying time. Born in Springfield, Ohio, Boyer graduated from the local High School and in 1922 from Massachusetts Institute of Technology. His first job was in the stockroom of Maxwell Motor Company, shovelling nuts and bolts. In January, 1923, Boyer joined Fisher Body, a General Motors subsidiary. In the early 1930's he became President and General Manager of the Allen Manufacturing Company. During the defense mobilization prior to World War II, Boyer was brought to Washington by General William Knudson for a 30-day assignment. He remained two years, and in 1943 became liaison man between the Chevrolet division and the Army Air Force. At that time Chevrolet operated five plants in aircraft engine production, making Pratt and Whitney power plants for B-24's and PBY's. In 1946, Boyer became Director of Production Engineering for General Motors from which position he took leave of absence on July 26, 1951, to accept his present assignment. Despite his major responsibilities in industry, Mr. Boyer has found time for personal participation in aviation artivities. He is President of the Detroit Aviation Commission, General Chairman of the National Air Races, and a "QB." With Mrs. Boyer and their four children, he lives in Michigan.

Harold R. Boyer

A. The preceding answer is certainly applicable to this question. When Pearl Harbor occurred, U. S. industry was already busy producing great quantities of material for the British and French, and our own defense program. The machine tool industry was expanding as a result of foreign orders for tools to build aircraft engines and many important defense plants were near completion. *At the time of Korea, the machine tool industry was having its own private depression,* and *the military also was retrenching.* Add to that the very complex nature of modern aircraft, as compared to World War II types, and you come out with some measure of satisfaction that we have done as well we have in the short time. It may not be as much as some would like, but it is a good record, all things considered.

Q. Can you give us some idea of the complexity of the modern military aircraft?

A. Here are just a few illustrations: *Fighters that weigh as much as the old B-17,* once our "heavy" bomber; sections of aluminum "skin" that run from $\frac{3}{16}$" to $\frac{5}{8}$" thick; *fighter wing sections strong enough to support the weight of two fully loaded Super Constellations;* automatic equipment of almost fantastic capabilities that make it possible for three men to operate a much more complex bomber than its World War II counterpart which had a crew of ten. *The B-47 contains 72,000 parts exclusive of nuts, bolts, and rivets.* The first B-47 plane required 3,464,000 engineering man-hours, against 85,000 man-hours for the first B-17.

Q. Does the Board have anything to say about aircraft design?

A. This is *almost entirely a military function.* After the plane gets into production, we may make suggestions aimed at simplifying production of some part of the plane or reducing the requirement of some scarce material or tool. Plane design is a full-time job for the designer, not a part-time job for the Board.

Q. What part did the Board play in readjusting military plane schedules?

A. As the lawyers say, the Board was in the role of "amicus curiae." It *worked with the Armed Forces to develop realistic production schedules* based on the latest available information as to the availability of facilities, tools, components, materials and on the relative essentiality of different types of planes.

The *previous schedules were expressions of hope* made, in many cases, even before the basic design had been completed, and before an appraisal of availability of machine tools and facilities had been made.

Q. What is your position on the question of mass-producing planes which will be obsolete tomorrow vs. intense research and the maintenance of the very latest in design at the cost of mass production?

A. This is a *matter of balance* in which many factors must be weighed. Our present policy incorporates both views: make some good planes now, then make more and better planes tomorrow.

Q. In the event that a properly financed and capable corporation offered its services for the construction of proven cargo aircraft, could your office provide assistance in getting materials and machinery?

A. Yes, *provided the firm has the sponsorship of the Armed Forces* or other government agencies and the power plant requirements do not conflict with the military needs.

Q. Is the wartime practice of subcontracts being used to the maximum?

A. Most prime contractors are making effective use of sub-contracting, but we have no measure for comparison with World War II.

Q. Has plane production been held up by lack of components?

A. To some extent, but these delays have not been serious, because we have been able to take spot action to overcome bottlenecks. Design difficulties dominate these shortage areas.

Q. Is the aircraft industry getting sufficient nickel, cobalt, columbium and titanium to build jet engines in the numbers needed?

A. No jet engine program has been held up by shortages of these materials. DPA-NPA policy is to meet military needs for materials in full after proper screening and certification.

(*Continued on page* 45)

Prior to mission, Capt. Pat Henry goes over every detail and phase of impending flight with crew of 55th Strat Recon Wing.

STRAT RECON + T

By HARRY LEVER

Ramey Air Force Base flight line is always busy as repair and flight crews ready RB-50's for regular training missions.

WHEN the B-29's dropped more than 300 tons of bombs on a Northeast Korean supply port only 20 miles from Russian territory, they centered their assault on railroad installations and blasted a whole marshaling yard to bits.

And just as important, from the point of view of moral reaction, the bombardiers didn't touch a single church, school or hospital which, in a small city, usually are not far away from military targets.

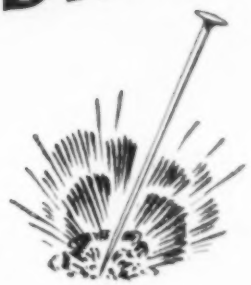
The reason was "pinpoint" bombing, principally abetted by some of the latest developments and theories in strategic reconnaissance. The success of pinpoint bombing has highlighted the Far East Air Force's grand offensive against Communist communication and transportation facilities, and has cost the enemy more than 30,000 vehicles, 6,500 freight cars, 200 locomotives and nearly 800 bridges so far.

A big answer to this pinpoint bombing and an answer as important as the mechanical and other strategic reconnaissance aids, is the furtherance of simple human deduc-

Without highly trained navigators like Lieut. Fred Guillermety wrong targets would be photographed and flight would fail.

Camera attached to plane's radarscope records on 35 mm, terrain below via radar impulses. Above, film is processed.

TECHNICAL AIDS + = "PINPOINT" BOMBING



Pinpoint bombing is not chance or luck, it's the work of the Strat Reconnaissance crews.

tion, pursued to a fascinating and absolute degree. For without this, the latest cameras, lenses, shutters and auxiliary equipment used in strategic reconnaissance hardly would be as effective.

A focal point for experimentation and development of the newest ideas in strat recon is Ramey Air Force Base, a Strategic Air Command installation just outside of Aguidilla, Puerto Rico. Perhaps this is because Ramey is comparatively near the Bahama Island group where the Air Force has its new guided missile test range, and strat recon already is playing a big part in this phase of warfare.

Much of the work at Ramey is shrouded in secrecy, such as the electronic make-up of certain cameras and other precision instruments, and the candlepower of new aerial photo-flash "bombs."

But it is at Ramey where the science of deduction really comes into its own through the 55th Reconnaissance Technical Squadron, composed of men highly trained to interpret and analyze photographed bomb targets. In fact it is their analysis alone which mostly determines what type and quantity of bomb shall be used on the target.

Like other strat recon bases, Ramey has several specific groups, each with a special mission in the field, and all under the overall direction of Brig. Gen. S. D. Grubbs, Jr., who at 39 years of age already has established himself as one of the Air Force's most capable officers.

In addition to the 55th Reconnaissance Technical Squadron, with its interpretive role, the other units are the 38th Strategic Reconnaissance Squadron, which is engaged in photo-mapping, and kindred research; the 338th Strategic Reconnaissance Squadron, which is involved with map-making and geodetic control and already has achieved somewhat astonishing results; the 343rd Reconnaissance Technical Squadron, which concerns itself with electronics, and the 55th Air Refueling Squadron which, through use of Boeing KB-29 aerial tankers, gives Ramey's RB-50's, modified for strat recon, their extra long range.

Each squadron has 12 RB-50's (*Continued on page 56*)

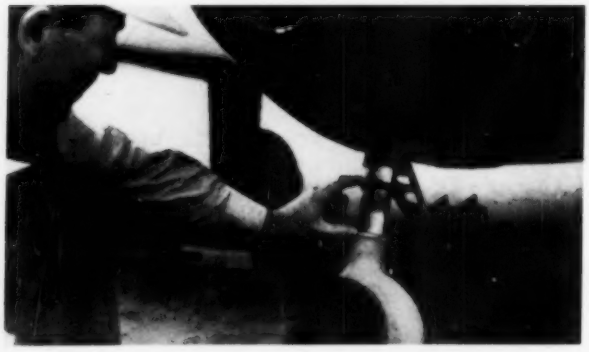
Technician uses stereoscope to make interpretation of photos. Report is then forwarded to higher headquarters for planning.

Terrain models, plotted from aerial photos and maps are accurate to every detail and used in instances of ground assault.

LOOK *before*

The wheel chocks should be in place before starting engine to guard against airplane creeping during pre-warm-up period.

Carefully and conscientiously check the condition of tires and wheels for imperfections in rubber. See that hub caps are tight.



A hard landing on a low strut can cause extensive damage and great expense. Check for proper inflation and possible leaks.

Don't just caress the tire, but use a sharp rap with the toe, which offers a quick and accurate method of testing inflation.

In October 1951 FLYING told you how to do a pre-takeoff and pre-landing check of instruments and engines. Now author-pilot Wesley Neal describes the importance of a complete pre-flight check—from tires to wings to external control locks and, best of all, how to do it yourself.

By WESLEY NEAL

Next step is to make certain that the plane's brake and hydraulic line is free from leaks and that fittings are quite tight.

you FLY

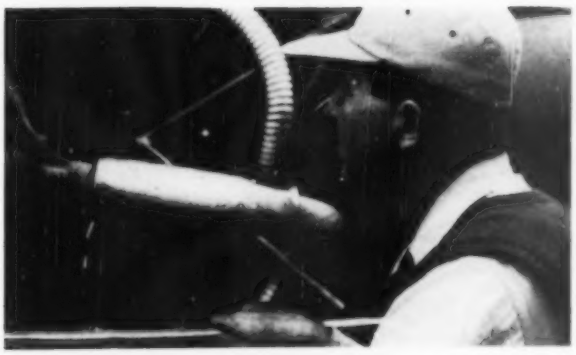
A DROPPING oil pressure gauge ain't funny. Especially when it's night and you're flying at a black, cold 5,000 feet over Okefenokee Swamp. You just thank your luck that you find a field where you can set 'er down in a hurry without having to pile into an alligator's backyard. But even your good luck doesn't make you feel any less like Simple Simon's demented cousin when you find that you're to blame for all the trouble. You forgot to check the safety on a sump plug.

Fact is, the gods that watch over ignorant airmen have their hands full every day. Consider the guy who tried to take-off with his control surfaces locked. This bird was lucky, too. He chopped the throttles in time. My friend Jake didn't. Jake taxied all the way out to take-off position leaning three degrees to starboard without realizing that he had a low strut. Jake ground-looped before he could cut the power.

Or a sensitive-seat boy we'll call Melvin. Melvin had to bail out of a "Bamboo Bomber" when the leading edge of his left wing collapsed, throwing him into a spin.

But why must we try the gods so? Simple enough to look for a loose sump plug. Control locks are big, ugly-looking things. And they're usually painted red. One good, solid rap on the leading edge of his wing would have told Melvin that the termites had moved in. But no—we're usually in too much of a hurry or too wise or too "hot" to bother with a simple thing like pre-flight. Could be the gods might get tired of our stupidity some day. Just in case they do, here's a bit of procedure that might help us to postpone that vacation in Valhalla.

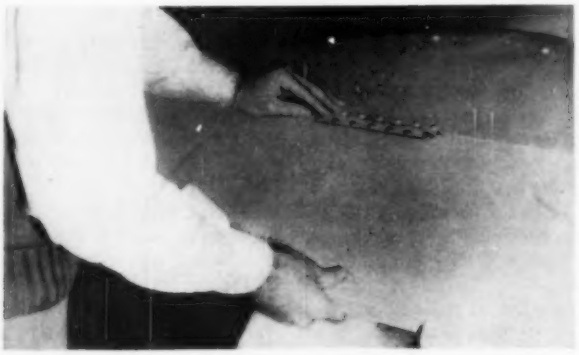
First thing I'd recommend is a piece of cardboard and some good, indelible ink. We'll (*Continued on page* 54)



Check powerplant for loose connections or broken safety wire. Keep eye out for stray wrench or rag tucked among cylinders.

After inspection of inner parts, make certain that all cowl and other inspection openings are really closed and tightly locked.

A propeller is a finely balanced device. Any nick, chip or splinter, no matter how minor, can cause havoc while in flight.



You may think that everything is snug and secure, but your hinges may be defective. Examine for signs of corrosion or wear.

An important pre-flight step is to check fuel supply visually and make certain that gasoline caps are screwed on to stay on.

By DON DWIGGINS

IT SEEMS incredible that, except for a few far-sighted experts, those responsible for flying safety have almost entirely overlooked the dangerous spiral dive.

You yourself may have slipped into sickening, diving turns when you weren't expecting it that loaded you and your airplane with excessive "G's" and momentarily confused you. If you did, and you lived to read this, you may be interested to know that you are maybe lucky to be doing so. Not that the spiral dive itself is a killer—it's a very simple flight maneuver.

But so is the stall—yet the Civil Aeronautics Board will prove to you that stalls are involved in more than half of all pilot error accidents. It depends on where and when it happens, and under what conditions. You stall a plane near the ground—boom. Stall it at a safe altitude, and you can recover easily.

Similarly, execute a spiral dive at a safe altitude, in good VFR weather, and you are flying a controlled maneuver that gets you downstairs in a hurry over a single landmark on the ground. But slip into a spiral dive under instrument conditions, and the chances are that you don't know what is happening until it's too late. The result is, you're listed under the heading: "Continued VFR into instrument weather."

That's the way the experts kiss you off. But while it's a sin to fly into an overcast when you're not trained to, it does happen now and then to the best of the non-instrument pilots when they get into a jam with the weatherman.

There are laws against aerobating close to the ground, too, but now and then somebody accidentally stalls and drops one in hard, which is not normal flying in my book.

So while the CAA and the CAB and other regulatory bodies are yelling about stalls and spins, let's see why pilots go on killing themselves the hard way—in spiral dives.

Like we said, the CAB chooses to list such accident deaths as simply "continued VFR into instrument weather"—which, in 1948, took 216 lives in 113 fatal accidents. Significantly, they admitted only 21 stalls were involved in the 113 fatal accidents in instrument weather. But they didn't say how many of the pilots met death in a screaming spiral. Maybe it's impossible to find out, after it happens.

Accident investigators go out and look over the wreckage of a nice private plane and look at the weather and check up on the pilot and decide maybe he was out flying when he shouldn't have been and so they drop it categorically into the "VFR in IFR" slot.

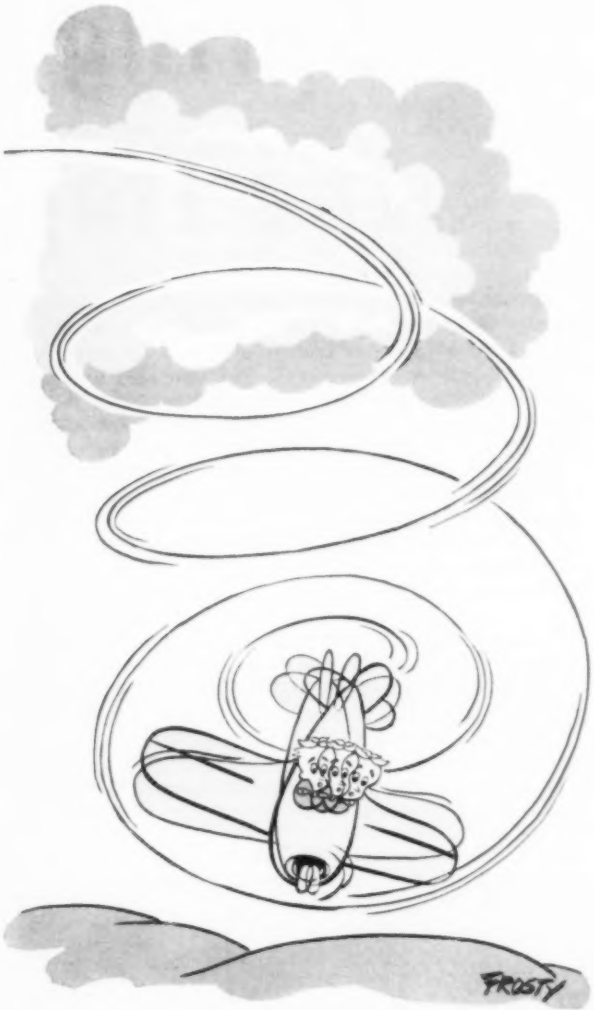
But behind the fact that the pilot got himself involved with zero visibility and crashed lies that deadly uncontrolled flight condition we're talking about—the spiral dive. This is simply a rapid descent to the left or right in an ever-tightening spiral, with increasing airspeed, that has to stop somewhere. Too often it stops on the ground.

Aeronautical engineers have strived for years to design spiral instability out of airplanes, but so far they haven't succeeded. True, most modern aircraft possess a high degree of true spiral stability, and if there weren't such things as friction of the controls and gusts and changes in airspeed and power settings and the like, you could trim up your airplane, set your alarm clock and wake up over your destination.

But airplanes don't fly that way. Not without autopilots. In good weather, maybe you can trim up your plane to fly hands off long enough for you to work out a navigation problem or read your favorite funny book. But in bad weather, if you feel you can trust your airplane enough to let it take you through an overcast hands off, you're a braver man than I am.

Trouble is, there's a lot of physiology mixed up in the

Until a cure is found, don't "catch" a spiral dive without instruments.



problem, along with the need for specialized training and good equipment. Instrument pilots know enough not to rely on their "senses" to fly an aircraft with no natural horizon to go by. The semicircular canals of your inner ears and your deep muscular sensibility go right on working, recording impressions and telegraphing them to your brain.

But sometimes these intricate organs of balance are little liars and you should have nothing to do with them. For example, a slip or a skid in a turn will cause your deep sensibility to warn you that you are banked or tipped in that direction.

Again, if you hold your head steady in a turn, you will have little or no sensation of turning. But if you drop your pencil and suddenly look down to the floor of your cockpit, you may get the warning from your ears that you just did a snap roll. This is because the movement of your head in a different plane in space places a new semi-circular canal in the plane of rotation of your aircraft. The canal rapidly accelerates in angular motion, while the canal originally in the plane of rotation of the aircraft slows down.

Roll into a turn slowly and maintain a standard three degrees per second turn rate and you may feel like you're flying straight ahead. But roll into a steep turn and you feel like you're doing a loop. Roll out, and you're sure you're in a steep dive.

Sometimes a pilot will attempt to climb up through a "hole" in the overcast, to reach blue sky above. Maybe half way up the hole closes and there he is, on instruments. He's still flying around in what he may think is a climbing turn to the left, his head out of the cockpit, looking for sky.

Then suddenly he glances inside the cockpit. Sure enough, his turn needle, if he has one, is swinging away over to the right.

Something is wrong, he says. After all, he was doing a climbing turn to the left when the lights went out, so it must be the instrument that's wrong. His senses scream at him that he's still going around to the left. But the needle argues with him. If he's a believer in science, he goes ahead and rolls his wings level with coordinated aileron and rudder, applied to the left.

Trouble is, it takes an inexperienced weather pilot to get into such a jam, and that kind of a pilot is likely to look first at his airspeed. By now it's pretty high, and going higher. So back he comes on the stick. The result may be disastrous, unfortunately, because he may be in a near-vertical bank, and back pressure on the stick simply tightens his turn and maybe blacks him out.

How did he get into that spiral dive? Any of a number of things could have done it. Unconscious stick pressure, too much or too little rudder pressure to correct for torque, or a wrong power setting. But he could have slipped into it from straight-and-level flight, with everything trimmed up beautifully.

Maybe a side gust slapped the nose of his plane to the left a little, or maybe an updraft picked up his right wing and forced him into a momentary sideslip to the left. If his plane's weathercocking performance was good, it probably would soon right itself. But maybe it didn't, and he remained in a slow and easy turn to the left.

The lift component of his wing is acting inward in a turn, and centrifugal force combines with gravity to cause the nose to drop a little, and the airspeed picks up. The outer wing is traveling faster now and picks up more lift, which causes overbanking, and the spiral begins. From there on in, unless the pilot is sharp enough to recognize what has happened and knows how simple it is to recover from the spiral, he's on his way to the headlines.

Recovery from a spiral dive on instruments, as from any unusual attitude, should be made by first centering the turn needle with coordinated aileron and rudder, and then bringing the airspeed back to normal with elevator pressure. But that's standard instrument technique and we don't need to discuss it further here.

What is important to you is to know how to stay out of a spiral dive if you aren't an instrument pilot (or even if you are one!) and avoid the impending trouble before it happens. Engineers would like to design an airplane that will safely take care of the pilot but, unfortunately, the perfect airplane has never been built. And many aviation groups today are devoting more and more attention to the spiral dive problem.

Passing attention was given it by the National Association of Aviation Officials last Summer, when their board of directors met at Kentucky Lake with representatives of the CAB, CAA and Crash Injury Research Department of Cornell University Medical College.

The board specifically invited (*Continued on page 59*)

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Supplies for fighting men on the ground fill the sky following air drop by plane of Far East Air Force Combat Cargo Group.

AIR DROP *Springs the Trap*

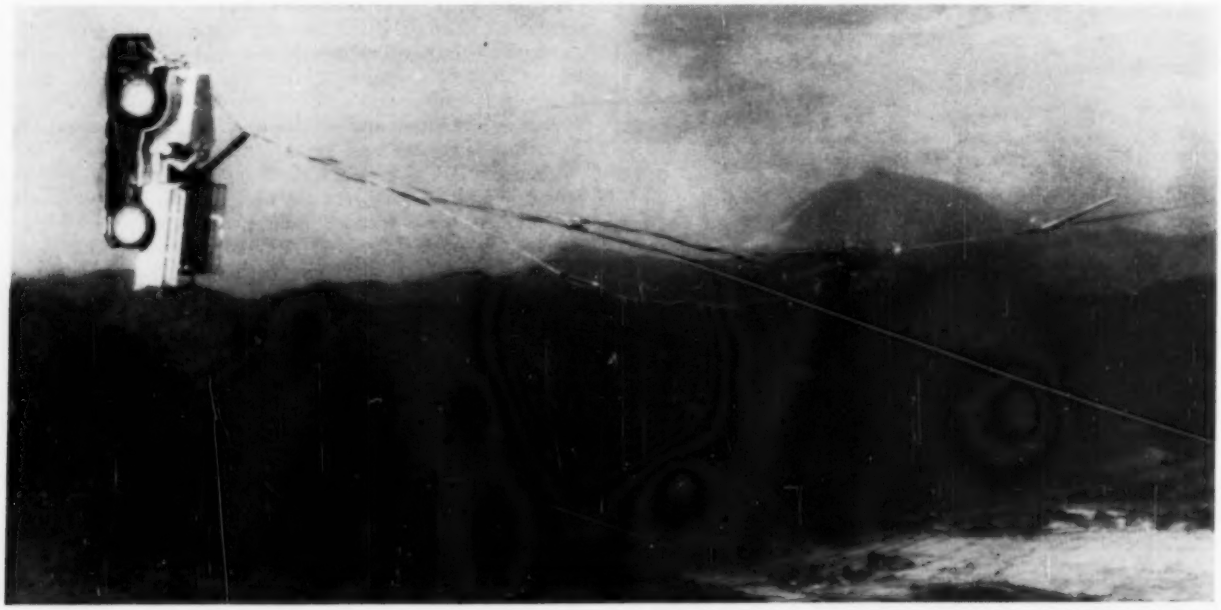
Aerial resupply has often meant the difference between victory and defeat, life and death in Korea war.

TRUCKS, howitzers, ammunition supplies, and bridges have been hurtling through the skies over Korea, bringing salvation to front line troops desperately in need of supply reinforcements. The extended use of air delivery, conducted by the 315th Air Division of the Far East Air Forces, is one of the most important military supply developments to come out of the Korean war.

Employed in several large scale operations during World War II, the air drop and parachute resupply has, of necessity, come into its own in the Korean campaign because of the obviously poor ground transport conditions.

The helicopter is fine for the transport of troops and light supplies, but the problem of delivering heavy-tonnage equipment over the impassable terrain was solved by use of the parachute. While the major portion of the Korean supply mission has been by airlift from airfield to airfield, the most important supply operations in support of sustained mobility have been those of the air drop variety.

The nature of the Korean campaign has necessitated, not a single or even a small scale series of drops, but an overall and continuing operation in support of the battling UN forces.



Glinting white in brilliant Korean sun, a weapons carrier has just been kicked from *Boxcar*, standing on end from initial shock of the opening of pilot chute. Shortly two other huge parachutes open, providing vehicle with safe downward passage to UN unit.

The men of the Army's 7th Division and the Marine 1st Division trapped at Chosin Reservoir know only too well how eminently successful the 315th Combat Cargo Division air drop has been. The C-119s were daily dropping hundreds of tons of supplies to the troops trapped by strong Chinese forces at the Reservoir in north central Korea. These troops were supplied entirely by air drop for two weeks.

At the same time, Combat Cargo C-47s were shuttling between Yonpo air strip near Hamhung and Hagaru-ri, a frozen rice paddy strip a few miles south of the reservoir, bringing out 4,375 Marine wounded in six days.

The case of the Chosin Reservoir is an isolated one, to be sure, but the combined efforts of the air drop and air lift meant the difference between annihilation and survival to those involved. There have been many such emergency drops that tell the same story of victory against what sometimes seemed to be insurmountable odds.

The Chosin Reservoir was also the scene of the first bridge in history being delivered by parachute. It was during this operation that a Marine unit was cut off. They had fought their way from the reservoir area down to the small town of Koto-ri. Here they were stopped by an apparently impassable gorge. Eight C-119s dropped a 16-ton bridge in sections to the unit. The eight-span structure enabled the Leathernecks to cross the deep canyon that blocked their escape route. And they were able to move on to Hungnam on the east coast with all equipment intact, carrying their wounded with them.

During October of 1950, the first airborne assault of the Korean campaign was executed when approximately 4,000 troops and several thousands of tons of supplies were dropped over a four-day period in the Sukchon-Sunchon area.

Combat Cargo air crews have many times accomplished the seemingly impossible by parachuting entire flight-loads of provisions onto small mountain-tops in support of surrounded friendly ground units. In many of these cases, a miscalculation by the *Boxcar* crews could cause the parachutes to deliver their loads into enemy hands, so close have been the perimeter lines.

One such drop was made within eight miles of the Manchurian border. UN forward units, fingering out in pursuit of disorganized enemy, often went beyond reach of their normal ground supply lines. The C-119s parachuted hundreds of tons of emergency supplies onto drop zones to keep these elements moving. The pin-point air drops just avoided the dangerous Manchurian border.

Because of the low altitudes at which precision drops must be made, Combat Cargo planes have been not only exposed to enemy ground fire but have received their share of battle damage. No matter what the weather or position of the enemy the drop hinges around two things: the drop zone and the wind.

To accurately place their deliveries within the drop zone, the cargo crews have squeezed their planes through dangerously narrow Korean mountain passes and sometimes at low altitudes over thickly-placed enemy gun positions. It is exacting work and exactness is strictly adhered to with purpose and tenacity. To deliver the load accurately and on time is the paramount purpose of the Combat Cargo air crews.

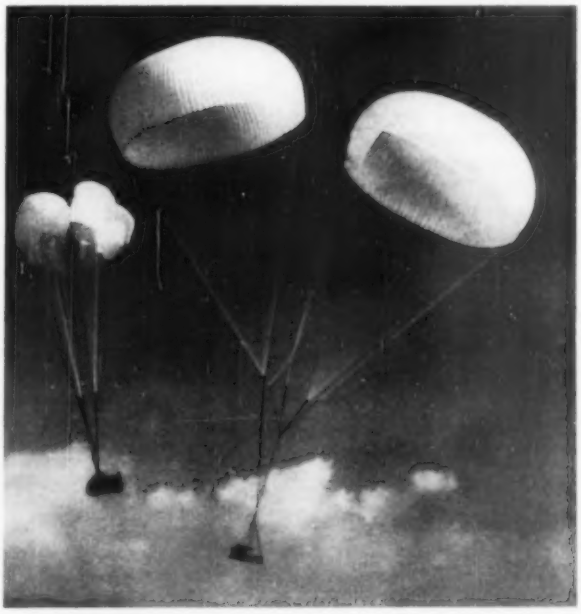
When necessary, planes have dropped an entire ground unit and resupply by parachute over an indefinite period.

Using all types of cargo-carrying aircraft, but placing emphasis on the C-119 *Flying Boxcar*, Combat Cargo has transported and air dropped items of logistical importance from candy and ammunition to three-quarter ton vehicles and two-ton artillery pieces.

Techniques required by dropping of heavy and unwieldy equipment have been (*Continued on page* 51)

Load of ammunition awaits kick-off from C-119. Entire supply will be delivered in a single pass when drop point is reached.

What seems to be a tangled mass of shroud lines and provisions will straighten out shortly as supporting parachutes open.



With supporting parachutes quickly opening, weapons carrier (left) and pallet with 10,000 lbs. of supplies begin descent.

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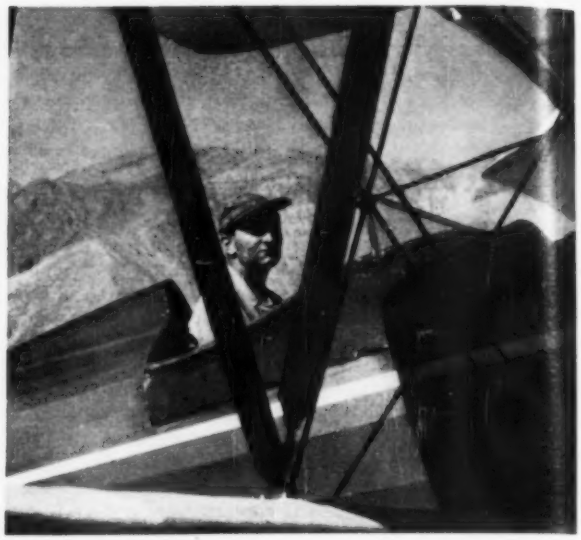
You wouldn't make much money but you'd have a lot of fun as a modern bush pilot like

Sierra Bob

By JAMES JOSEPH



With the Sierra Nevadas in the background, Bob White sits in the cockpit of the Waco, which he uses in his charter service.

PROBABLY more often than any other pilot in continental America, raw-hide, tanned Bob White has set his ship down among the peaks and nosed to a landing on the sloppy strips of the Sierra Nevada. For Bob White is an old-hand Sierra bush pilot.

Maybe that's why he's amused whenever a visiting private flyer lets down on the Lone Pine, Calif. (elevation: 3,700 feet) airstrip. No sooner does the visitor climb out of his ship than he greets Bob with: "Hey, aren't you the Sierra pilot I've been hearing about?"

Bob avers that he is, and his face creases in a leathery smile. He got that baked-potato look flying his open-cockpit Waco into the rarefied altitudes above the Sierras.

Invariably, there's a pause—embarrassing at times—and then the visitor dives in. "Is it really as rough as they say, this being a bush pilot? And how are the financial diggings?"

"Rough?" Bob replies. "That just depends." Then he motions toward his squat, modest quarters over by the hangar. "Wouldn't exactly say we're getting rich here," he says simply.

But Bob White's answer hasn't really answered that burning question which bothers many a private flyer who hankers for a more rugged airborne career. These flyers ask themselves, "Why couldn't I, a hot pilot if there ever was one, combine business with pleasure and charter back into the fishing and hunting country?"

That's a reasonable question and Bob White, who has flown a couple of thousand charters into the wind-blastered Sierras since 1944, is a guy with the answers.

First, Bob will tell you, find a jumping off place. A strip within a convenient and economical radius of the mountain hide-outs. For Bob, it's Lone Pine, which lies in the Owens Valley—brow-beaten and Lilliputianed by the towering Sierras on the west, and hedged in by the geographically ancient 11,000 feet Inyo mountains on the east. Fifteen air miles west of Lone Pine rises Mt. Whitney's 14,495 feet summit. Both ranges cast their shadows ominously over the Lone Pine airport, where Bob's three-seater, bi-winged Waco is tied down against the strong valley winds when it's not shuttling into the mountains.

Bob's charter service hops off from the most convenient field in the Owens Valley. Within a radius of about 25 air mile's are spotted three mountain strips—that lead directly to golden trout and deer. There's also a lot of photographic scenery, something Bob throws in free with every charter.

Bob, along with a few competitors, is the only easy way into the Sierras. If you've got strong legs and a heart to match, you can walk in, or pack back by horse or mule. There was a time not many years ago when the hardy old mountain men who run the pack outfits swore mightily at each intruding aircraft.

"Those sons-of-guns will fly in sporting riff-raff and they'll fish out the mountains," packers lamented. But Bob has proved that he's as much interested in preserving fish and game as the next guy. Bob flies in a fishing party to one of the three mountain strips scraped from the high meadows. Packers meet his ship, carry his charters still deeper into the Sierras.

This is a new allegiance, and it startles the packers who instead of berating the airplane, now thank Bob for bringing in customers. Fact is, packers often phone out of the High Sierra strips over the jaundiced Forest Service line, asking Bob to pick them up for a flight to the valley. It's a two-way, amicable exchange now, for Bob White has become the ambassador of aviation goodwill in the Sierras.

Although 75 per cent of his gross revenue comes from bush-charters, Bob also takes time off in winter to parachute supplies to snowed-in mines. For four years he's held the Forest Service contract to carry rangers and wardens into the back country. Summertimes he often flies cattle men into mountain meadows where beef, laboriously driven to high altitude pastures, fatten. Once, he flew a hog into a strip where a pork-hungry mountaineer waited, armed with a butchering kettle. When forest fire fighters are battling high altitude blazes, Bob drops them food and supplies.

All of which points to one of the seldom-recognized requisites of the successful bush pilot: versatility. One day you may charter a plump lady into the back country, the next day, a bale of hay. The chartering-in price for both

Flights into the Sierras are short but very often rough. At the left, Bob loads passenger and gear into his 300-hp. open-cockpit Waco. Relaxation is in order after a flight and (right) Bob enjoys a talk with a camper at one of his meadow landing strips.

types of service is essentially and usually the same.

Says Bob, "I've carried everything into the Sierras from a two-months old child (his own) to horse-drawn wagons." Then he smiles, "Of course, we unhitched the horses first."

How'd he get the wagon in? "Simple enough," says Bob, "we knocked it down, flew it in piece by piece, and the packers put it together again." Bales of hay, food, and extra saddles are routine, seasonal cargo.

During fall deer season, it's not unusual for his Waco to set-down at Lone Pine with a couple of choice bucks strapped in the front cockpit.

Bob's range of operations is remarkably confined. The three high Sierra airstrips, between which he flies, lie only 25-miles radius from Lone Pine. A half-hour's flight gets you to any one of them. In an hour, you can just about make the circuit. The same one-way trip by pack animal requires a minimum eight hours over back-breaking, nerve-shattering trails.

There's a strip at Tunnel Meadow, elevation 9,000 feet, approximately 15 miles south of Mt. Whitney. The strip, like most others in the Sierras, is one way, east and west, and 75 feet wide, 1,600 feet long. Lower horsepower at high altitudes calls for longer take-off room, one reason why there are so few landing places in the mountains. At Templeton, a few miles south of Tunnel Meadow, there's a 2,800 feet strip at 8,500 feet elevation. Monache Meadow, five miles south of Templeton, is usually in good shape. Scraped from the floor of a mountain valley, Monache has a 2,800 feet runway, is at 8,000 feet. Each season the strips are dragged, either by packers or by forest service men.

After deer season, the strips are deserted, for no one lives year-around in the Sierra uplands. As Bob sees it, the Sierras are pretty routine. A lot of other flyers might not agree, but then they haven't come to know every peak and valley as an old friend. Bob flies by instinct—and mountain sense, self-taught and hard-learned. There are no nearby weather stations, and the valley stations are useless in predicting weather over the strips. Caution and an instinct for the Sierras (*Continued on page* 42)

In the Fall, Bob is busy flying geese hunters to happy hunting grounds. Wintertime, however, he devotes to Forest Rangers.

Although he's interested in preserving fish and game, Bob's passengers never suffer from lack of good trout fishing at all.

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The *Flying Fortress* ten-man crew, shown above returning from a mission during World War II, is almost a thing of the past.

3 for 10

B-17 veterans are learning how 3 men can do the work of 10 in jet bomber training at Wichita.

Close-up of radically new *Stratojet's* sleek nose shows one reason why only three-man crew is needed—excellent cockpit visibility.

By ED HOADLEY

A BIG B-17 pulled up to an abrupt stop on the concrete apron of a bomber base in Britain and ten exhausted airmen spewed out of doors and hatches all over the aircraft, bringing to a finish another gruelling day's work over Germany. By World War II standards their job was well done—they hit the assigned target hard, they were not hit by flak or enemy fighters, and they were in as good physical shape as they could be after the tension of the long ride.

It is problematical to judge just how much coordinated teamwork contributed to the success of that mission, but the chances are that they would have had a much rougher time and less successful going without the kind of teamwork Uncle Sam builds into his airmen.

Today, that kind of teamwork is just as important as it was then, perhaps more so. Loads are not very much heavier, nor are the bombers very much bigger, but they do fly higher and faster using extremely sensitive and costly equipment and new techniques for carrying out their assignments.

Yet, today's jet bomber crew—with the exception of the B-36—is a three-man team—trained, experienced and capable of doing the same job it previously took almost a dozen men to do.

Obviously, these modern bombers and new techniques demand that any two of the three men aboard can take over all jobs at a moment's notice. The Air Force even toyed with the idea of using a two-man crew, as in the XB-51 and the original version of the B-57A. However, the B-45 and the B-47 currently carry a crew of three, and that seems to be pretty much the modern pattern, although a tail gunner may be added in some models of the B-45.

Thus, a somewhat definite crew pattern has been established—pilot, co-pilot and radar operator-bombardier-navigator—each having the training and the ability to function effectively at the other man's job.

In 1949, we had some 18 flight training bases in the United States, but by 1950 there were over 100 and the figure has increased since that time. Among these new installations is the Wichita Air Force Base, Wichita, Kan.

It is the responsibility of Col. H. R. Spicer and his 3520th Combat Crew Training Wing to indoctrinate bomber pilots and air crews in the principles of Boeing *Stratojets*. To properly do this the Wichita Municipal Airport was purchased by the Government, runways were extended, 87 acres of concrete ramp alone have been poured, and $75,000,000 were spent to create a gigantic and permanent air base. Like an atomic explosion this transitional center

Captain Worthington (left) receives instructions on starting fuel sequence in T-33 from his instructor Lieutenant Ohanesian.

Graduates of 3520th Combat Crew Training Wing are crew members of the six-engined B-47 *Stratojet*, powerful strategic bomber.

has mushroomed into being. Mammoth facilities are needed to train this triumvirate—the B-47 team.

Who are these students?

Most of them are combat veterans in piston-engined bombers. "Fruit salad" is thicker on the base than at a chain restaurant. Rank varies from second lieutenant to full colonel. However, the students leave their medals and rank at the front door. They receive no demerits for not attending class—ground school or flight. They suffer no drills, regimentation, or red tape. They dress correctly, act correctly, and understand correctly from habit. Their intense interest is reflected from discerning eyes, rather than from open mouths. Their cadet stage was completed long ago. They are treated as gentlemen and students.

Their course of study has three phases. In the first, the single-engine jet indoctrination, they must be thoroughly "jeteducated." They master the T-33 two-seater fighter-trainer. If they pull boners on the flight line or in the air, their instructors do not hesitate to lower the boom. For instance in Flight "A," class 51-7, Capt. Everett M. Worthington (DFC, two Air Medals, etc.) and Lieut. Col. Dick Evans (who flew General Montgomery all over Africa) are students of Lieut. Edward O. Ohanesian, a crack jet pilot who was an enlisted gunner in World War II. (To maintain instruction at peak there are no more than two students per instructor.) When either student makes a mistake, Lieutenant Ed chews them up. The first two B-47s cost almost $12 million and Ed has a lot of responsibility.

The second phase of study consists of B-47 transition. The pilot student really gets involved now for he must be able to handle 150 dials, gadgets, levers in a tight cockpit while travelling over ten miles a minute. The bombardier student uses only 125 but must be able to point out each one while blindfolded. The third member of the team doesn't have too much to do save ride herd on the others.

The third and final phase is combat crew training in the B-47. Here the triple-threat and quadruple-threat men learn to function as a unit. Back with their permanent outfit they have learned to operate in squadrons, or singly.

The full course takes 15 weeks. In the phase at Wichita first the students spend half a day in ground school and the rest on the flight line. Instrument flight and fuel management are stressed since high speed jet aircraft operation requires almost professional skill in instrument flight as well as cruise control. Many hours of ground school as well as air instruction are taken up in repeating the many detailed fundamentals associated with these two key subjects. Proficiency and professionalism are a must.

Thirty-six hours are required in the T-33 and over 200 in ground school. The first week consists solely of ground school instruction. Here students learn introduction to jet flying training and physiological training, introductory to high speed flight training. They have to be alert and efficient in temperatures ranging from ultra-hot to ultra-cold and in speeds approaching the sonic range, and there are introduced to these new mediums.

The second week the student goes for his first jet ride. Captain Worthington gave me his impressions:

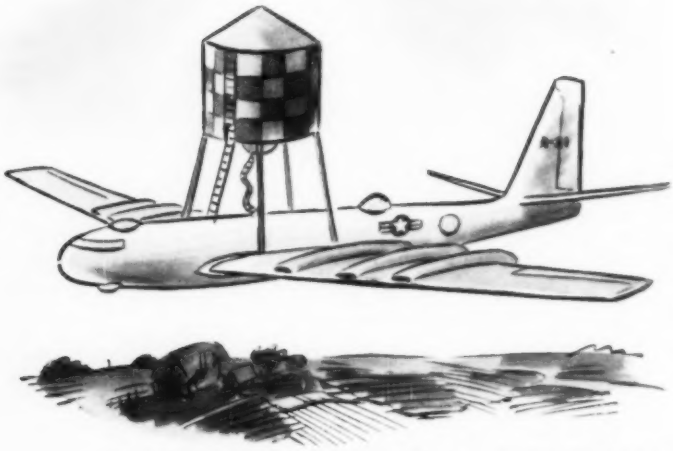
"We were at 300 m.p.h. indicated before I knew what had happened. This was right after take-off. I had remained at 300 m.p.h. before. (*Continued on page* 43)

Author Hoadley, rear cockpit, taxis out for familiarization ride with T-33 instructor in the front cockpit at the controls.

In second phase, students learn to handle all B-47 instruments in the tight cockpit while travelling over 10 miles a minute.

S H H H H...

COCKPITS HAVE
BEEN SIMPLIFIED



RANGE IS NO LONGER A PROBLEM

GUIDED MISSILE

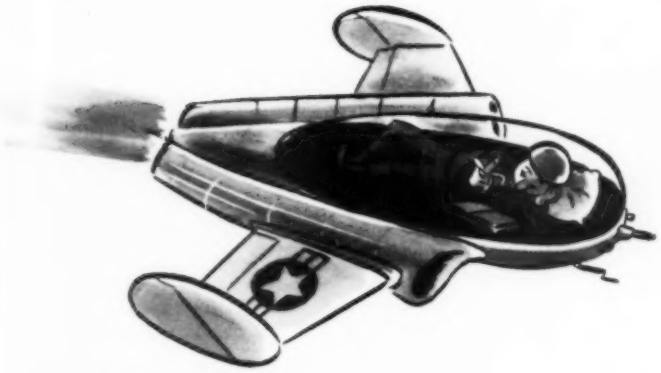
PILOTLESS BOMBER ELIMINATES
MANPOWER REQUIREMENTS

Flying lifts the veil! Exclusive!
Sensational! O'Brien meets
the crisis.

Range for bombers . . . the hell-raising propensities of Willie turned upon the enemy . . . unerring direction for guided missiles . . . reduction of combat fatigue . . . jet propulsion of armies . . . elimination of manpower . . . relief of Staff burdens . . . and if a few humble chores remain . . . take heart. O'Brien is still thinking!

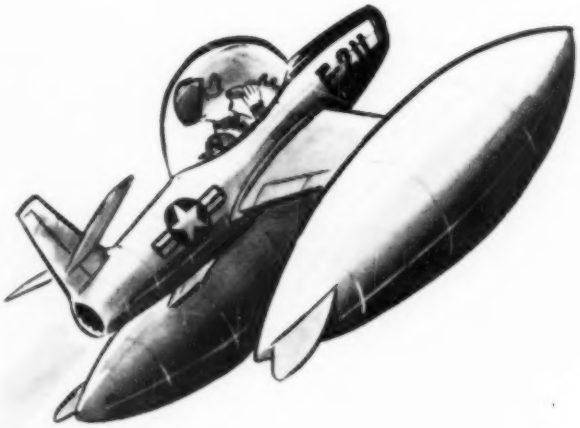
DON'T TELL JOE!

BURP JET



PRONE FIGHTERS
REDUCE COMBAT FATIGUE

THE ULTIMATE WEAPON



GLOBAL MISSION SLICK SHICK

THE INDISPENSABLE MAN

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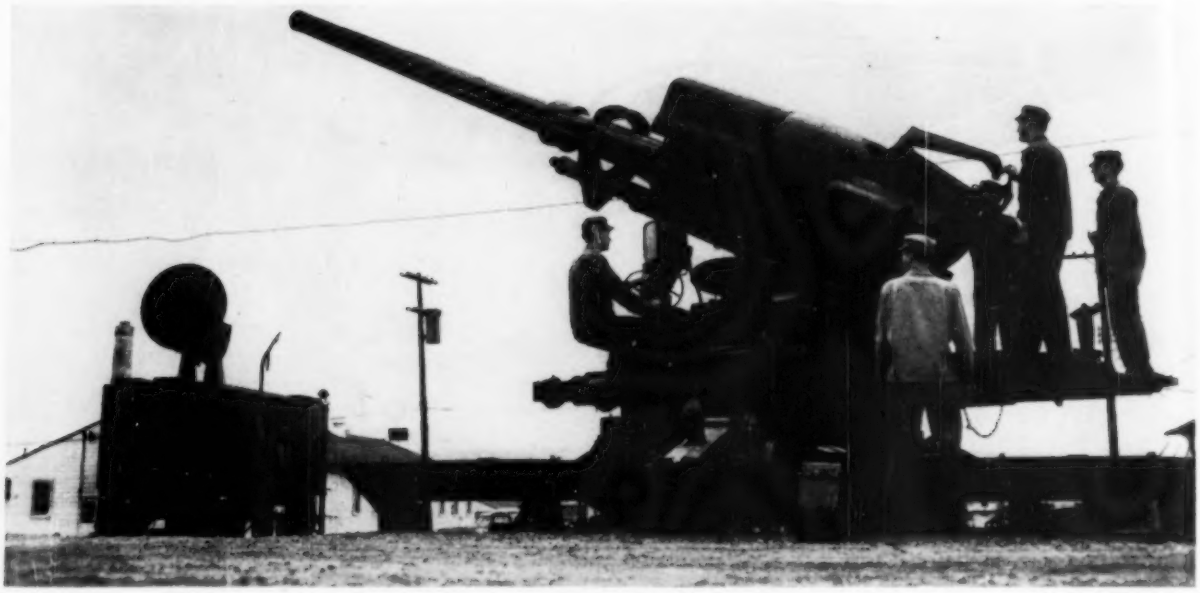
MINUTE MEN of '52



One of the prides of the Army's Anti-Aircraft Command is their 120 mm. "Little Long Tom," long-range anti-aircraft gun. Weighing three and one-half tons complete with a power loading system, it is operated in conjunction with the T-33 control range finder.

By JAMES L. H. PECK

WE'VE lost more airplanes over Korea than have the Reds: nearly 300 more, at this writing. Although this has not been played up in the news, the Department of Defense discloses that some 85 per cent of our losses are due to "ground fire"—mainly automatic weapons and heavier anti-aircraft fire. This bad news immediately raises certain questions concerning our own ack-ack. You haven't heard much about it; but this is not because our own anti-aircraft people haven't been keeping their powder dry. In fact, they're loaded for bear.

Any Soviet bomber crews who evade the interceptors will be greeted over here by such tokens of welcome as the "Skysweeper," "Duster," or "Stinger." Those who survive will long remember this new anti-aircraft artillery, these several types of improved proximity-fused ammunition, and those better-than-human fire control devices. The survivors will hold great respect for the new operational techniques we have developed for using these guns and their complex sighting gear. But, the Reds will not be able to appreciate from the distance the extent to which all these elements have been integrated into a series of anti-aircraft weapons systems.

The weapons' system concept might be called a scheme for anti-aircraft defense in which the men and their guns, radars, computors, and directors serve only as wheels in the machine. It is a scheme, moreover, which seeks ultimately to eliminate almost entirely the men from the machine. The concept is epitomized, for example, in the sensational T-69 Skysweeper gun system.

This murderous 75-millimeter weapon detects and identifies its target, loads, aims and fires itself automatically—without a man around, after it has been set and cocked. This robot gun's high cyclic rate of fire and astonishing accuracy are said to provide a high "kill probability" against even missiles and supersonic aircraft. All the gimmicks but the director-radar are self-contained within compact units right on the gun carriage. One of these interesting devices locks the trigger mechanism automatically whenever the Skysweeper trains itself on a friendly airplane.

If the weapons system concept has its end product in weapons such as the robot gun, it initiates with the Army Anti-Aircraft Command. This agency was activated in April 1951 to be responsible for the artillery units assigned to the air defense of continental U. S. and certain overseas areas. The AA Command coordinates this defense activity with that of the USAF's Air Defense Command. And despite the difference in the tools of their trade, both commands of our defense team have the same mission—shooting down enemy airplanes.

Thus, both the AA and air units have identical command structure; and to facilitate further their coordination of effort these commands' headquarters are situated together at Ent Air Force Base, Colorado Springs. Three subordinate regional commands for both ack-ack and air defense also have parallel organization. WESTARAACOM

If war comes, the Anti-Aircraft Command is prepared with improved ammunition and better-than-human control devices for defense.

(service abbreviation for Western Army Anti-aircraft Command) coordinates activities with the Western Air Defense Force; and both are situated at Hamilton AFB, California. CENTARAACOM is located at Kansas City, Mo., with the Central Air Defense Force headquarters. And EASTARAACOM, although based at Middletown, N. Y., functions with the nearby Eastern Air Defense Force at Stewart AFB. The overall Army Anti-aircraft Command is headed by Maj. Gen. Willard W. Irvine; and his coordinating activities extend even to the Navy. Through its excellent early warning and communications setup and great firepower potential of ships in port, the Navy is considered as a valuable member of the U. S. anti-air defense team.

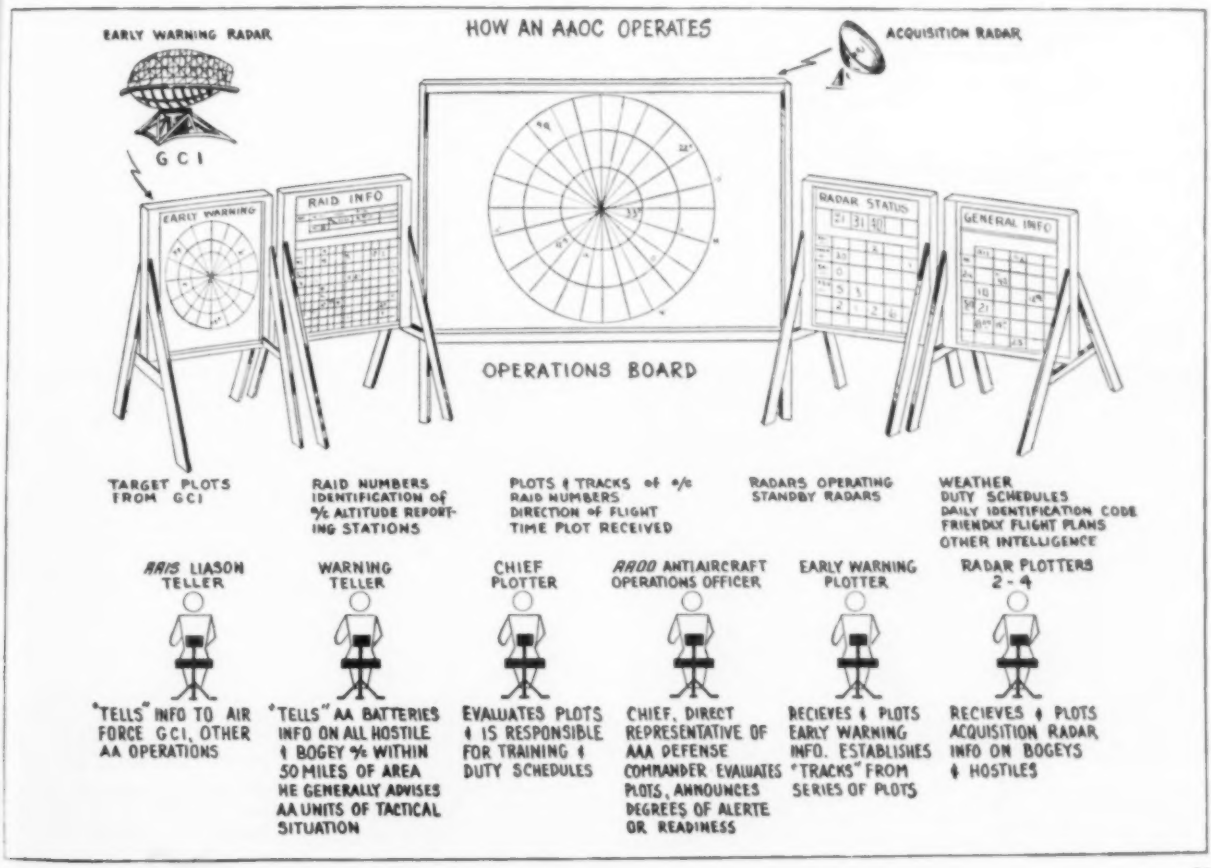
The other source from which the weapons systems concept stems is the Artillery and Guided Missiles Branch of the Artillery School at Fort Bliss, Texas. On this encampment, proving ground, and firing center twice as large as the state of Delaware, the training of AA personnel and development of AA weapons and tactics is conducted.

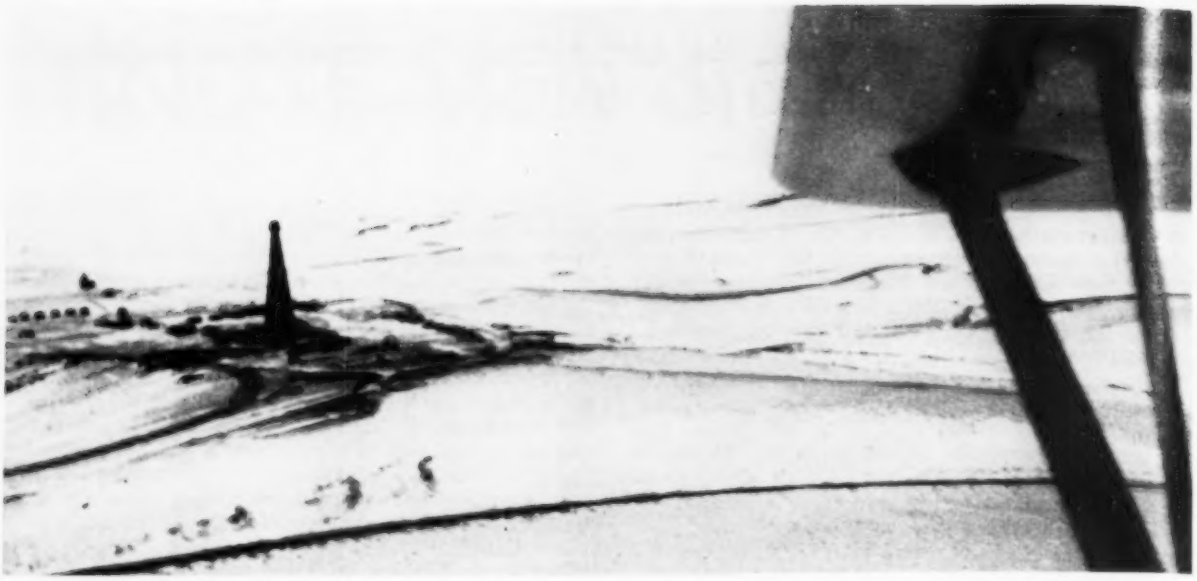
The deep thinking on these matters takes place within the Research and Analysis Department of the school. These are guys who answer, among others, such questions as: "How many AA batteries will it take to defend New York or Washington?" "With the 60 batteries available for the AA defense of Portland, Oregon, what percentage of attacking aircraft can we expect to shoot down?" "How far away from—or how close to—the city should we set up our guns?" Within the Army Field Forces and the USAF, these men are known as the "R & A Boys."

They will tell you that the 120 mm. "Little Long Tom" is the largest gun the AA Command will use, if war comes; and they've got the figures to prove that this gun is big enough to take care of any forseeable AA defense problem. The 120 is normally found around the outer perimeter of an objective's defenses. This is a big 30½-ton gun with a power-operated loading system. A crew of 13-15 men can operate this M-1A1 gun to fire from 12-15 rounds per minute. It throws a 50-pound projectile "considerably higher than 48,000 feet."

Next comes the 90 mm. M-2 gun. An air-transportable version weighs only 9½ tons, while the standard towed-carriage model grosses 15½ tons. The 90 is hand-loaded, but the average crew can handle up to 25 rounds per minute. This gun shoots a 23-pound shell to altitudes above 30,000 feet.

The 75 mm. Skysweeper, aforementioned, shoots a 3-in. shell "to intermediate altitudes. (*Continued on page* 61)


HOW AN AAOC OPERATES
EARLY WARNING RADAR
ACQUISITION RADAR
GCI
EARLY WARNING
RAID INFO
RADAR STATUS
GENERAL INFO
OPERATIONS BOARD
TARGET PLOTS FROM GCI
RAID NUMBERS IDENTIFICATION OF % ALTITUDE REPORTING STATIONS
PLOTS & TRACKS of o/o RAID NUMBERS DIRECTION OF FLIGHT TIME PLOT RECEIVED
RADARS OPERATING STANDBY RADARS
WEATHER DUTY SCHEDULES DAILY IDENTIFICATION CODE FRIENDLY FLIGHT PLANS OTHER INTELLIGENCE
AAIS LIASON TELLER
WARNING TELLER
CHIEF PLOTTER
AAOO ANTIAIRCRAFT OPERATIONS OFFICER
EARLY WARNING PLOTTER
RADAR PLOTTERS 2 - 4
"TELLS" INFO TO AIR FORCE GCI, OTHER AA OPERATIONS
"TELLS" AA BATTERIES INFO ON ALL HOSTILE & BOGEY % WITHIN 50 MILES OF AREA HE GENERALLY ADVISES AA UNITS OF TACTICAL SITUATION
EVALUATES PLOTS & IS RESPONSIBLE FOR TRAINING & DUTY SCHEDULES
CHIEF, DIRECT REPRESENTATIVE OF AAA DEFENSE COMMANDER EVALUATES PLOTS, ANNOUNCES DEGREES OF ALERTE OR READINESS
RECIEVES & PLOTS EARLY WARNING INFO. ESTABLISHES "TRACKS" FROM SERIES OF PLOTS
RECIEVES & PLOTS ACQUISITION RADAR INFO ON BOGEYS & HOSTILES



"Deep freeze country" pilots maintain a year-round supply and lifeline for oil drilling rigs such as this. Here, within the Arctic Circle, drillers bore through 1,000 feet of frozen earth. With the snow and sky blending into a "pail of milk," pilots fly most at 100 ft.

By HOWARD WALDORF

THE UNITED STATES Navy Petroleum Reserve No. 4 in Northern Alaska is believed to be the world's largest oil claim now being worked by prospectors. Surely it is the most desolate—60,000 square miles of flat, trackless, even treeless waste between the grim, forbidding Brooks Range of mountains and Point Barrow, our last bit of land on the way to the North Pole. Oil crews, finding that the ground is permanently frozen to a depth of more than a thousand feet, have named it "Deep Freeze."

Above ground the region is almost as impenetrable, so difficult of access and so dangerously impossible to traverse that only the growing need for more oil warrants the Navy's present serious and costly efforts to develop the Reserve, although the first oil slicks were discovered at Simpson Seeps in 1886. Modern equipment and, even more vitally important, air transport now make the project practicable.

Author Howard Waldorf of Oakland, Cal., poses alongside the bush plane in which he covered 5,000 miles within the Arctic Circle in mid-winter to gather the material for this story.

For more than a year Transocean Air Lines has been operating an airlift, even more, a vertitable lifeline between the main base at Fairbanks and Point Barrow, with branch lines radiating off to one side or another, supplying all the oil camps in the Reserve, which is larger than Illinois or Kansas. When Orvis M. Nelson, Transocean's president, worked out the airlift contract with the Navy, he used his own experience flying transport over the Alaskan front during the war. He organized a special division with two distinct operations—linehaul from Fairbanks to the main bases, and bush flying from the bases to the oil camps.

The land does not produce a single item for the project. Only one surface supply expedition—and that by sea—can get through to Point Barrow in a year, so the job of air transportation is tremendous, running into many millions of pounds.

Then there are other jobs, all in keeping with the code of the North—mercy flights in the dark of winter to fly the sick and injured to the lone medical station on the edge of the Polar Sea; flights to guide native hunting parties to the reindeer and caribou herds, the walrus, the polar bear and the spouting whale, when life for an entire village depends on the success of the hunt; the dropping of food, ammunition and medicine from the outside to the Eskimo villages and camps; and then, too, piloting the annual surface expedition through the ice floes to a safe anchorage off Barrow.

The linehaul pilots fly the C-46's and a ski-equipped C-47, droning through the day and night with capacity cargoes of gasoline and diesel fuel, fresh meat, vegetables and fruit, dynamite (they use hundreds of thousands of pounds of it in the Reserve), tools, repair parts, cement, the California-made "mud" used to seal off the pressure in drilling, and a thousand and one other items.

AIR LIFT over the DEEP FREEZE

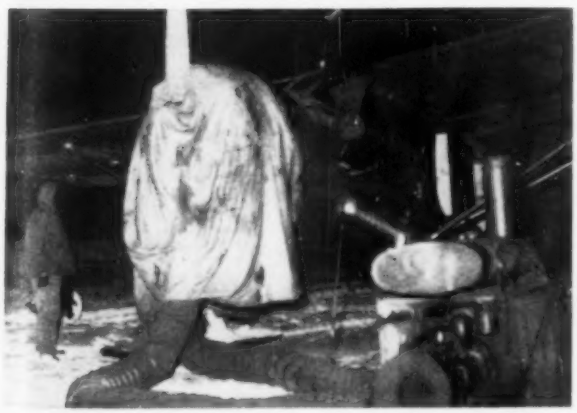
Oil workers and Eskimos rely on hardy, resourceful bush pilots for link with world beyond the Arctic.

Unloading is swift as the cold will permit when precious cargo reaches its destination. Soon the plane will be airborne again.

They pick up their main loads at Fairbanks and lift them over the Brooks Range at 11,000 feet, then into Umiat, southernmost drill camp of the Reserve, and then on across the flat, frozen tundra to Point Barrow, the advance base. They take on 11,000 pounds at a time, with Eskimos doing the loading at the Reserve bases. Between flights on the 600 mile Barrow-Umiat-Fairbanks run, they wing to the outlying camps where there are no runways. There they drop cargoes from the air. Brightly colored parachutes break the fall and guide camp retrievers to the supplies. The Eskimos like to fly. They are eager to serve as "pushers" on the drop flights. Of course they like the wages they earn, too.

The bush pilots fly single-engine planes ranging from the Norseman, carrying a thousand-pound load at 150 miles an hour, to the smaller Taylorcraft. There are plans for a helicopter to do some of the special work. During the long winter, which lasts nine months at least, with temperatures as low as 56 degrees below zero on the surface, the bush planes are equipped with skis. During the few weeks of summer, when the sun turns the land into vast lakes and pool-dotted swamplands, wheels or floats are used.

At the home base of the bush flying section in Point Barrow the long winter produces every obstacle known to aviation, except heat. Polar storms born on the ice pack whip up into a blinding 100-miles-an-hour fury in a few minutes, and remain for days. For the greater part of the year the snow and ice and their vicious teammate, ice fog, blot out the few landmarks in hundreds of miles of tundra. When the ice fog closes in, all forward vision is blocked. Even navigation on the ground is difficult. From Transocean's headquarters at Point Barrow to the airport is normally two blocks, yet (*Continued on page* 46)



Transocean pilots of the "deep freeze country" maintain their aerial lifeline, even when temperatures skid to 56 below. Here the war-born "Herman Nelson" is used to heat a plane engine.

A friendly "weasel," backbone of Arctic ground transportation, helps break skis away from ice. The scene is the U.S. Navy Petroleum Reserve #4 located 150 miles south of Point Barrow.

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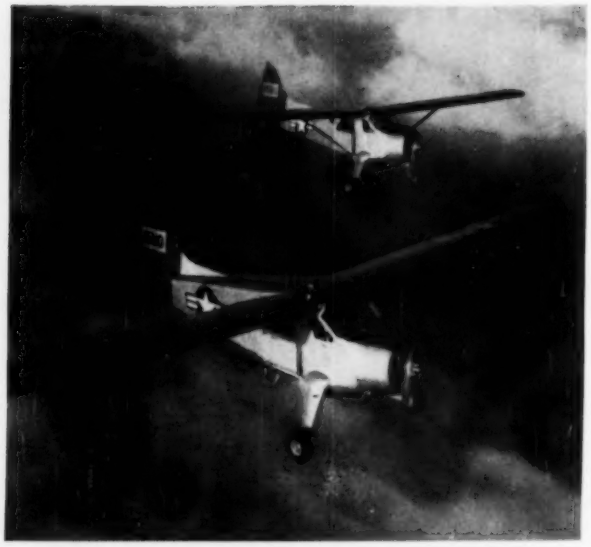

The *Beaver* won the competition for an Air Force liaison plane by scoring highest on all four parts of the evaluation: flight check; maintenance look-see; design check; ability to produce.

The AIR FORCE buys a PLANE

By R. G. NAUGLE

IT WAS said sardonically during the last war that you didn't get into a puddle-jumper—you put it on. But the last in the long line of Air Force liaison planes is a hefty half-ton truck—the 450-h.p. Canadian de Havilland *Beaver*—the "Eager" *Beaver*—pride of the bushwhacking backwood operators among our northern cousins. The Air Force now calls it the L-20.

The *Beaver* was picked over a group of seven American entries in a recent Air Force competition as a light utility cargo and personal carrier to replace the obsolete Convair L-13 and was bought substantially as an "off-the-shelf" airplane. The ground forces are covetously eyeing it as a general-purpose aerial workhorse able to carry a 1,000 pound payload in and out of rough unprepared areas near the front lines.

Its 125-cu. ft. cargo compartment with doors wide enough to load litters, fuel drums and bulky equipment makes it a natural for the ground force in their rough and ready ground support operations. In fact, the ground force's obvious need for something like the *Beaver* may be the lever to break their bitter deadlock with the Air Force over who's to buy and fly small ground support aircraft. As it now stands, the ground forces aren't allowed to buy anything over 2,500 pounds empty—or anything armed. They want to do both and have managed to get their hands on a few *Beavers* for testing.

As a matter of fact, they're also said to be interested in the twin-engine *Aero Commander*.

The Air Force have had their eye on the *Beaver* for some time. Even before the competition, a *Beaver* was demonstrated to top Washington and Wright Field officials —even before the official "Military Characteristics," or specifications for the competition were published. But no specific manufacturer nor certain model can be considered "sole source" in government procurement without a terrific hullabaloo from others in the industry who are sure that their product is better.

Manufacturers, therefore, were given a chance to show their wares in an open competition held at Wright Field. Since this was an immediate off-the-shelf procurement, experimental or even modified commercial models were out of luck. The winner had to have a CAA type-certificate in the normal category prior to actual procurement—and the contract was to be let im- (*Continued on page* 63)

Competition runs high when the Air Force is shopping for an airplane. Here's the story of how a plane from Canada—the de Havilland Beaver won over all U. S. entries.

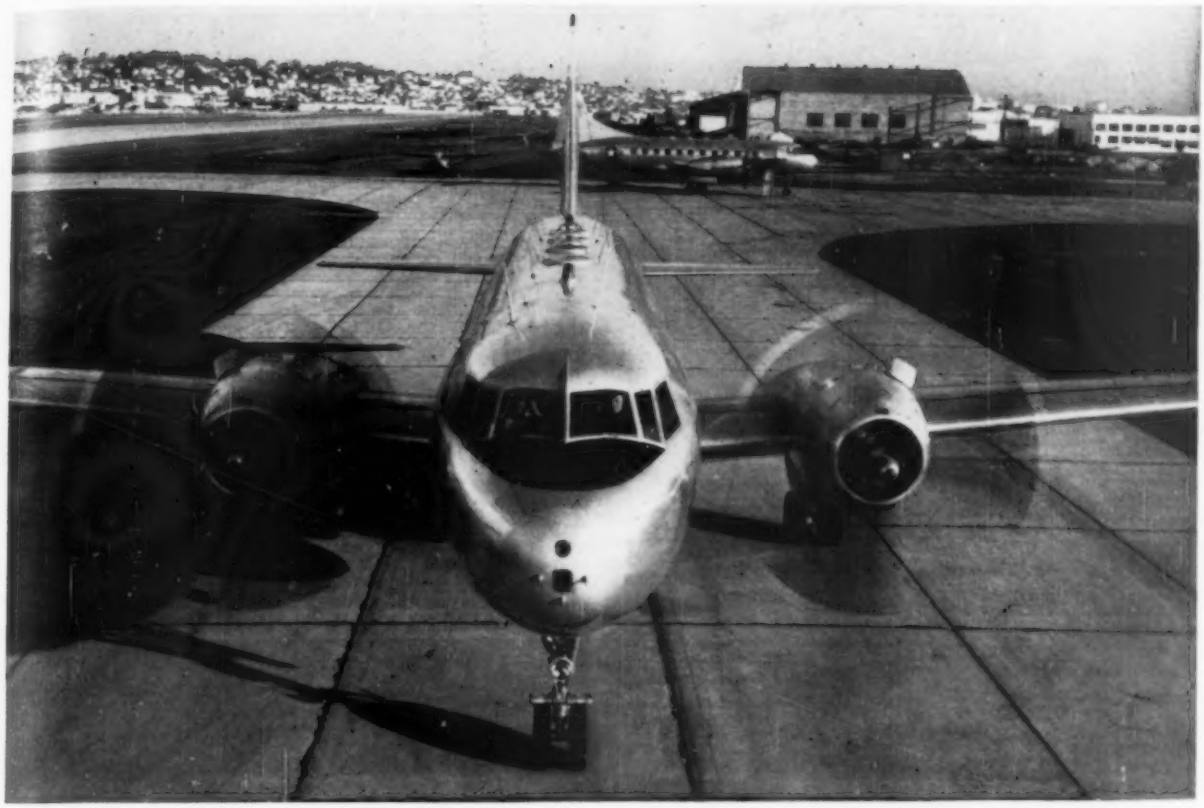

Photo of first pressurized T-29B navigator-bombardier trainer as it was rolled out for delivery to Air Force. Gross weight of new model is 43,575 lbs. Three astrodomes are now installed.

HAVE YOU SEEN?

An evolutionary development from the DC-6, the new DC-7 will have a top speed in excess of 400 m.p.h and normal cruising speed of more than 360 m.p.h., a 50-mile increase over DC-6.

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Chief of Research of the Kaman Corp., Igor B. Benson, is not playing games with a toy helicopter as it appears at the left. He built the model shown above to help in the investigation of jet propulsion for large transport-type helicopters. The two-dimensional research model is made of balsa wood.

The Dart *Kitten* is British ultra-light design which comes in kit form. Top speed is 90 m.p.h., range 340 miles; price $900.

Built by the Technical College of Milan and designed by Stelio Frati, *Rondone* F-4, Italian plane, has top speed of 161 m.p.h.

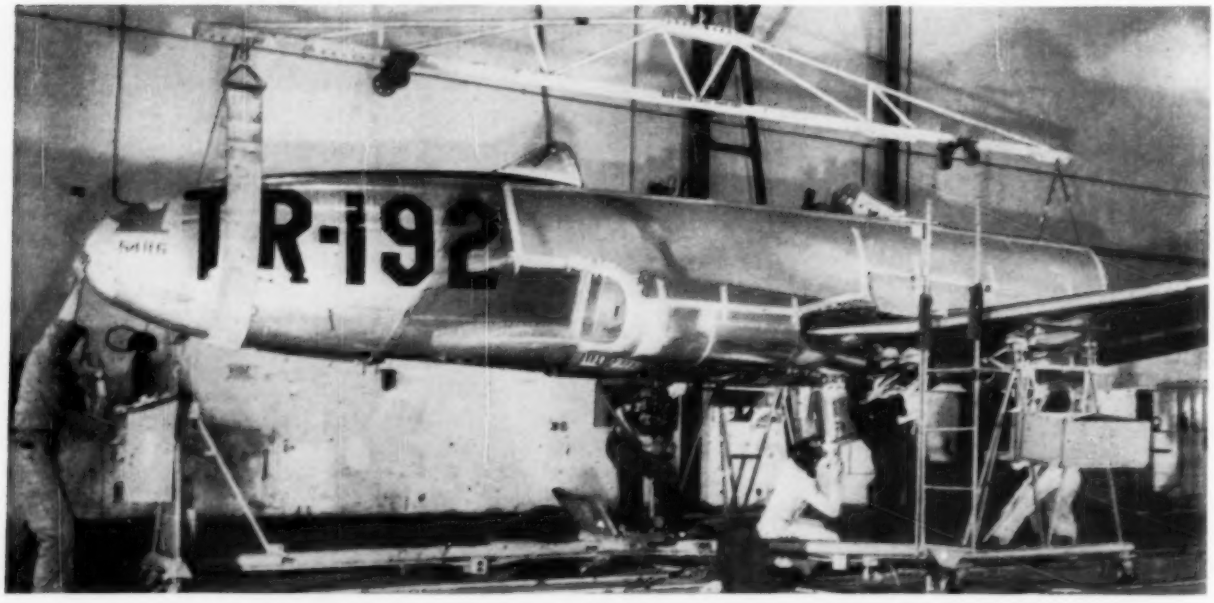

Photo lesson on how to build a jet—in this case the Lockheed T-33. Workmen make scores of hose, wire and tube connections. Process takes 8 man-hours. Next step is assembly of landing gear, tail section. Note how jig frame is wheeled to assembly line tracks.

First USAF-approved releasable illustration of Beechcraft twin-engine T-36 advanced trainer-transport. Powered by two R-2800 P&W engines, it has take-off ratings at 2,300 hp. Span is 70 feet, length is 52 ft. 2 in. Take-off gross weight is over 25,000 lbs.

Otter has close to double payload of Beaver with comparable performance. Initial rate of climb is 1,050 ft. per min.

Existence has been revealed of Saab-210, advanced experimental delta-winged aircraft. Most distinct feature is very large fin, and its braking parachute.

The latest version of the flying automobile—the Aerocar—is its larger "H" tail. The top speed is now over 110 m.p.h., take-off run is 655 feet. It takes four minutes to change from airplane to automobile. Overall length is 25 ft. with wide road tread.

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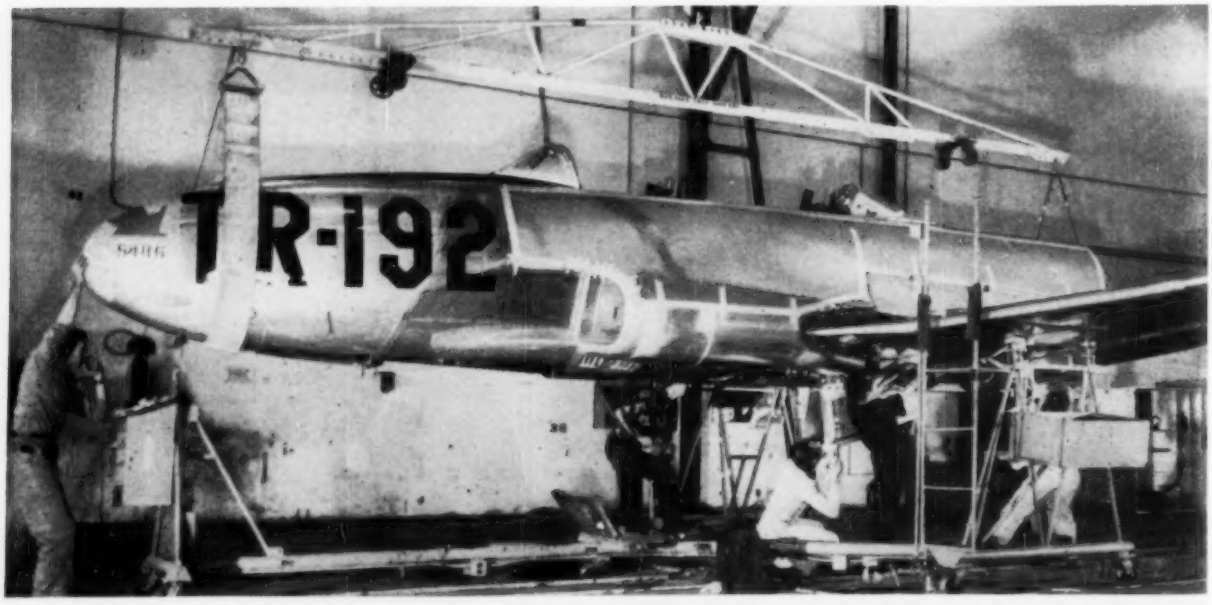

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Pilot proves that carelessness gets you trouble—but a preflight check will get you back home safely.*

I Learned About Flying From That NO. 147

By MEL LEWIS

The mishap the author describes happened during his training in 1943. Above he poses with his F-51 during a lull on the island of Saipan in 1945—an older, wiser and safer pilot.

* See page 18

IN THE cold grey dawn of a February morning, the cadets of Squadron "A," stood at attention in a column of fours on the flight line at The Santa Maria Air Base awaiting the dismissal order from the flight leader. His curt "squadron dismissed" cracked out above the roar of a half a hundred Continental 220 h.p. engines, as the PT 13's were being warmed up preparatory to the morning flying period.

We each reported to our respective instructors and were soon being briefed on the maneuvers to be practiced for the day. Minutes later the Stearman biplanes were taking off one by one enroute to their assigned practice areas.

My instructor was a quiet, efficient and earnest man, with many hundreds of hours of civilian and military flying time behind him. He had "learned about flying from" past experiences such as appear monthly in this department and subsequently was untiring in trying to get his hard learned lessons across to his students.

The one thing he stressed so highly, was the thorough inspection of the airplane before take-off. Second to that, he insisted on the use of the check list—before, during and after flight—no matter how well the student knew his airplane and procedures.

Since I had been fortunate enough to accumulate several hundred flying hours previous to entering the service, my instructor left me pretty much to my own devices except for a periodical check ride. Consequently, I failed to benefit from some of the finer points of his excellent teachings.

One bad habit that carried over from my civilian flying was that I was inclined to skip over my preflight inspection in short order and to inspect only the major parts of the ship. Little did I know then that before the day was over I would be taught a lesson on aircraft inspection.

I was assigned to PT-13 No. 306 and was told to proceed to a practice area about 20 miles west of the field and practice right and left spins, chandelle turns and snap rolls for the one hour period. By the time I was assigned my airplane most of the other students were already in the air, so I made a hurried inspection of the plane checking only the guy wires for tightness and checking the wingtips for evidence of ground loops. I climbed into the cockpit and gave the line mechanic the signal to wind up the inertia starter. At his signal, I engaged the starter and the engine barked into life.

The engine ran very rough, after a few moments of listening, the line mechanic signaled me to cut the switch. A brief inspection disclosed that the plugs were badly fouled and the mechanic informed me that a plug change was necessary. Since no other airplane was available, I grew increasingly impatient during the 20 minutes it took to change the plugs. It was necessary to take advantage of every minute of flying time available in order to have the required number of hours completed by graduation time or face the prospect of being held over for the next class.

With the plugs changed and the engine purring like a well-fed kitten, I disregarded every thing else and took off setting a climbing course for the practice area. The air was smooth, the visibility clear, and the Stearman responded to my touch like it had suddenly become a thing alive.

My patience was relaxed when I found myself at 5,000 feet over the practice area. I put the Stearman into a smooth 360° turn, checked above and below for other planes. Apparently alone in the skies. I lined up on a road, eased the throttle back (*Continued on page* 59)

AIRCRAFT OWNERS AND PILOTS ASSOCIATION

AOPA NEWS

Aircraft Owners and Pilots Association is a service organization for the private pilot or aircraft owner. AOPA's full time staff is devoted to helping the individual pilot. Its aim is "To make flying more useful, less expensive, safer and more fun."

Headquarters address is Box 5960, Washington 14, D.C. Members also receive a special AOPA edition of FLYING, newsletters and confidential aviation data. Opinions expressed in this column are not necessarily those of FLYING Magazine.

ANNUAL REPORT

AOPA's annual report for 1951, which goes to members in its entirety, reveals a number of interesting facts about AOPA, its operations and its growth in 13 years.

At the time the report was closed, AOPA's membership stood officially at 37,691.

In AOPA's 13-year history, 663 died from various causes.

Member-servicing continued to be the largest single activity of AOPA's Washington staff. During 1951 AOPA's staff wrote and mailed 39,196 individual letters either to members, or concerning members' problems. That's an average of 3,266 outgoing letters per month. The volume of incoming mail was so high that staff time could not be spared to count it.

AOPA Flight Service activities boomed. About 1,650 members asked for flight-planning assistance during 1951—a 230 per cent increase over 1950's total. About one-third of those were foreign flights, largely to Latin America.

AOPA's Chart Service also pointed up the increasing volume of travel being done by members in their own planes. During 1951 the Chart Service handled a total of 52,363 Sectional and WAC charts —an increase of 41 per cent over 1950.

AOPA accomplishments during the year included adoption of a revolutionary new group life insurance program for AOPA members, which they can purchase at standard rates with no aviation markup.

AOPA National Headquarters moved from downtown quarters to a new, larger building in Bethesda, Md., a suburb of Washington.

In addition, AOPA staff members had to either participate in or keep tabs on approximately 100 Government, policy-making and technical committees and groups in Washington.

Discussing the outlook for 1952, the AOPA report said:

"The outlook for 1952 indicates AOPA will continue to grow. The growth probably will be slow because of several factors, all of them directly traceable to the national emergency. Many AOPA members have returned to the armed forces, and others still are going. Increasing costs have taken their toll of privately-owned aircraft, although the use of those planes in their work by business and professional men has increased dramatically. New-plane production has been cut back because of materials shortages.

"As conditions in the United States place greater emphasis on the defense effort, it is expected that the majority of all active pilots and plane owners in the country will have joined AOPA to protect their civil-flying interests."

MEXICAN DEAL CLOSED

AOPA's appointment as an agent for RAMSA (Radio Aeronautica Mexicana, S.A.), reported under way in the last AOPA NEWS, has since been confirmed by RAMSA's board of directors. In the near future, AOPA will have a supply of RAMSA contracts and credentials at National Headquarters in Washington which AOPA will issue to AOPA members on request for a flat monthly fee of $2.31 (20 Mexican pesos).

Because all of Mexico's aviation radio aids are privately-owned (by those airline companies operating in Mexico), those companies pooled all their radio resources under a single non-profit operating company (RAMSA) which the airlines themselves formed. The Mexican company is patterned after ARINC (Aeronautical Radio, Inc.) in the United States, although ARINC only operates the various U. S. airlines' privately-owned facilities. Unlike Mexico, the majority of radio aids in the United States are owned and operated by the Federal Government.

Because the Mexican facilities are privately-owned, AOPA arranged what it believes to be the best compromise with RAMSA: to sign up AOPA members travelling into or through Mexico on a monthly contract basis, for the nominal $2.31 fee. RAMSA's charges on a non-contract basis add up to several times that amount, just on a routine cross-country flight in Mexico.

Meanwhile, AOPA is participating in the planing of the new streamlined border-crossing program now being completed by representatives of the U. S. and Mexican governments. The new program is patterned after the highly-successful program now in effect on the U. S.-Canadian border, and in which AOPA played a leading role. Pilots crossing the Canadian border southbound simply file a flight plan, which automatically serves as notification of both Customs and Immigration officials at the U. S. airport of entry. Previously, it was the pilot's responsibility to notify each agency individually.

The proposal for the Mexican border is to use that system both ways, both for north- and south-bound traffic. RAMSA will be the single contact in Mexico, the CAA in the U. S.

GASOLINE CHANGES

AOPA has just published a new AOPA Special Report dealing with the recent changes in aviation gasoline specifications announced by the Petroleum Administration for Defense. The new PAD order makes it mandatory that all refineries use tetraethyl lead in all aviation gasoline.

Because that order means that clear aviation gasoline will no longer be available, AOPA surveyed a number of aircraft-engine and gasoline experts. AOPA's Special Report contains comments and advice to AOPA members from Lycoming, Continental and Aircooled (Franklin) engines; and Gulf, Shell, Standard of California, and the Texas oil companies.

Copies of the report are being mailed free to all AOPA members in the Active category (not Regular members).

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Military News

(*Continued from page 7*)

by Viking No. 7, is 135 miles. Expectations for the new rocket are much higher.

. . . Goodyear Aircraft has announced the organization of a new division to handle rocket components for the government. At this writing, officials of the company state that construction of the building to house the production machinery are just about one-third complete. A staff has already been appointed but adverse weather conditions have impeded the completion of the new facilities. The deadline set, however, is May of this year.

JETVILLE, U. S. A.

. . . In a section of desert land destined to become a world center of jet aviation, Lockheed launched first production operations a short time ago at Palmdale, Calif.

Staffing its new $400,000 hangar at the outset with 52 employees, by March there were 125 and the summer should see at least 250 personnel living and working in Jetville.

The first activity at the new center is flight tests on current models of the F-94. These planes, built at Burbank and Van Nuys, are trucked about 50 miles to Palmdale for completion of assembly and flight.

The location was chosen by the Air Force for the $30,000,000 jet center. Eventually Northrop and North American also will transfer some work, of undisclosed scope, to Jetville. AF officials estimate the Palmdale field now a county airport, will have a jet flight every nine minutes, both night and day under full operation.

BRITISH REVEAL ROBOT JET

. . . Details are just now available on the first pilotless jet aircraft to be test flown on Australia's rocket range. It takes off, maneuvers and lands strictly by radio control. To be used as a high-speed target for weapon testing, the plane was designed by the Government Aircraft Factories of the Australian Department of Defense.

The engine is an Armstrong Siddeley *Adder* baby jet, only 27 inches in diameter and 550 pounds in weight, it is Britain's smallest jet engine.

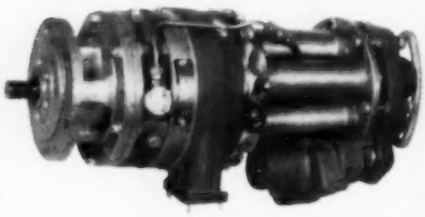
The sleek streamlined fuselage is 22 feet long with short straight stub wings which are detachable. Instead of an undercarriage, the aircraft has a skid landing gear. During take-off run the plane uses three-wheel trolley which is jettisoned at the instant of take-off and has brakes which automatically stop it on the runway.

Another difference from the piloted version is the disappearance of the cockpit canopy. Instead, the cabin is fitted with a special radio and autopilot. There is a single air intake for the engine on the upper fuselage.

Production versions will use the Armstrong-Siddeley *Viper* jet engines, Britain's first expendable jet. It will be cheap to produce and will have a total running life of only a few hours.

JET STARTERS

. . . The Plessey Company of Ilford, Essex, England has introduced a turbine starter—Type T. S. C. 50, Mk. 3—specifically designed for use with the Rolls Royce *Nene* 4 turbo-jet. It combines the desirable characteristics of low installation weight and short starting time. Carrying a nest of six cartridges, it permits three starts to be made without reloading. With a total energy output of 64,000 feet per pound delivered in a working period of two seconds, the starter provides rapid, smooth acceleration enabling a start to engine idling speed to be made in under ten seconds.



. . . Bendix Aviation is producing an airborne jet-plane starter—said to be the first of its kind in the world. It will operate completely free of ground crews and ground equipment. About the size of a standard typewriter, it weighs only 75 pounds. It packs 380 h.p. and completes its starting job in three and one-half seconds.

. . . Designed to meet the power supply requirements of the nation's jet bombers, the Selenium Rectifier provides d.c. power for both jet engine starting and radio-radar checkout. The pneumatic-tired ground unit supplies a continuous output of 1,500 amperes at 28 volts. An unusual feature of the rectifier is a multi-position selector switch to allow the operator to select the necessary voltage current characteristics for his particular testing or engine starting needs.

PROJECT SOIAS

. . . The Air Force conducted special cold-weather operations with three Ryan *Navion Super 260's*. Working from a Canadian base, the object was to obtain ski design criteria and determine the most effective use of airplane skis in a wide range of snow and ice conditions.

Modifications of the three planes, including the installation of heaters and instruments to record ski data, was effected in the engineering shops at Wright Air Development Center. The tests have been centering around the utilization of the wheel replacement ski.

For Project SOIAS—Sliding on Ice and Snow—the winterized *Super 260's* operated in a 300-mile radius centering at Kenora, Ontario, in the Lake of the Woods Country just above the Canadian border almost due north of Minneapolis. A Northrop YC-125 and a Douglas C-47 were used in support of the project.

HUGE UTILITY 'COPTER

. . . The XH-16—huge Air Force helicopter—was removed from its assembly jig at Piasecki just recently. The 77-foot six-inch fuselage of the helicopter is the same size as the Convair 240 Airliner. However, it resembles the small Navy HUP tandem helicopter in configuration.

Powered by two Pratt and Whitney R-2180-11 engines, the first transport craft will be capable of lifting very heavy loads of military supplies for longer distances than any current helicopter. Forty passengers or 32 litters can be carried in the cabin.

Now being fabricated, the second H-16 will use shaft turbine engines. It is anticipated that use of gas turbine powerplants will considerably increase mission performance, both from useful load and distance.

The Air Force is visualizing the H-16 as a vehicle for mass rescue in all types of emergencies over water or land, without need of landing. The combination of the large cabin area and the detachable capsule will provide new flexibility in supply and evacuation operations.

Agri Cub

(Continued from page 13)

ing measurement. I estimated an average of not over 500 feet from fence to clearing taxi turn, however.

Climb characteristics were fine. The instant I broke ground I leveled off but found it was unnecessary. The second it became airborne there was a solid feeling in the seat of my pants and she went right on up. Since the plane had only a standard altimeter, I could not verify feet-per-minute climb exactly, but in 60 seconds the plane moved from 1,000 to 2,000 feet. It climbs quite safely at 70 m.p.h. indicated with about a 15° wing angle with the horizon line. At this altitude the nose comes up even with the horizon line. I tried coordination exercises while climbing. Aileron and rudder control feel the same as the Piper J-3—it takes a little of each. The elevators seemed stiff and it took a little trim to neutralize pressures. Level flight characteristics are good and visibility is excellent. The nose rides about 18 inches below the horizon. Cross-country flight should be relaxing.

Stall control is good. It goes through the sequence with no tendency to fall on either wing. Normal power-off flap-up stall occurs at 38 m.p.h. indicated. Since the instrument does not record below 40 m.p.h. I could not get an accurate reading on power-on half-flap stalls, or full flap stalls. Vertical turns are easily executed and the airplane is stable. With the large skylight one can see at about any angle he desires. I was able to coordinate vertical turns without change of altitude. Chandelles and wingovers require the same technique as in the Piper PA-11.

After lunch, I headed NNE towards the dusting strip west of Delray Beach, Florida. It was an afternoon that a pilot dreams about. The PA-18A was purring contentedly. I relaxed in my shoulder harness and smiled at a happy Florida in mid-winter. Cruising altitude was 1,000 feet, airspeed was steady on 92 m.p.h. with tachometer on 2,300 r.p.m. I could have run the engine almost at rated r.p.m. as the plane has a special fast turning high performance prop on its nose; 2,300 obtains almost maximum range.

Minutes later at Delray Beach, I turned due west and headed for the Everglades. About six miles west was the narrow landing strip used by Jack Reynolds and his Airplane Crop-Dusting and Spraying Company crew. There I turned the airplane over to the dusting boys and sat back to watch them work it over.

R. E. King, World War II Stearman instructor with 5,000 hours' time, was the first to check fly the Piper. "Got any characteristics?" he asked, as he pulled on his helmet and goggles.

"I don't know of any. I just flew it the first time a couple of hours ago," I replied, "but why the helmet and goggles in a cabin airplane?"

He didn't answer but I knew then that even duster pilots are a little superstitious. As he broke ground, he leveled off and came screaming down the cross-wind strip right at us. Just before the wires he yanked the stick, and I do mean "yanked," and leaped into a 45° climbing turn to the left. He felt it out in some quick stalls then came down over the wires and pulled the hopper handle. As the wheels played tag with the ground the white dust fogged out behind him. I had been told that a Stearman will get span coverage. Pilot King was getting full span coverage and then some.

On each pass he climbed in a 45° downwind pattern, then into a vertical turn on the deck and back across the field, simulating the work that a duster must do. Five skilled pilots worked the PA-18A out that afternoon. When each had finished, I asked opinions of the fitness of the Piper as compared with the old souped-up Stearman.

Their answers as they climbed out of the plane were quite similar. They seemed to favor the 450 PW Stearman a little because (1) they thought it got better coverage, (2) it would carry heavier loads, and (3) they were not as likely to become hurt in the inevitable "fanny-busting" as it was so quaintly put. They liked the PA-18A better than anything else to date, including the C-85 J-3, and were enthusiastic about "that terrific reserve power." They also liked the visibility.

As Elmer Bryan of Martinsville, Virginia, expressed it: "When you are shooting up over the wires in your down-wind turn, you can look back and see your pattern. Then you can compensate for wind and drift. This makes the job quicker and simpler."

I later asked the Piper Company about comparing the PW-450 Stearman and they were free to admit that the UA-18A could not compete in load carrying ability or in performance at maximum loads. However, the Piper was tested against 220-C and 300-L Stearmans and it performed just as well with similar loads, and at a fraction of gas and maintenance involved. During tests it flew at a 3,000 pound gross weight.

Pilot W. J. Tennille, Milledgeville, Georgia, liked the flaps. He said that with half or full flaps you got more turbulence, thus insuring uniform spread. One of the pilots took issue with this, so we fired up the Piper and shot passes with (1) no flaps, (2) half flaps, and (3) full flaps. I'm not a duster so could not professionally judge which was best and the pilots themselves reached no conclusion.

The factory recommends half flap during dusting runs as a result of their tests. It was stated that full flaps cannot be used because of excessive drag. At half flap position the increase in drag is offset by the increase in lift, which is not true with full flap. It did appear to me like the half flap technique stirred the dust a little better.

The boys all liked the shoulder harness and would not fly without it. The feature of the removable belly plates for cleaning out purposes was admired. The slow-flight characteristics were praised.

By way of possible improvement it was suggested (1) at first glance the hopper was not braced enough, (2) elevator control might be eased (production models have been changed to reduce elevator stick loads), (3) hopper handle should be reinforced (it seems that sometimes the dust doors stick so the pilots really give that lever a pull), (4) loading lid should be bigger and have quick release snaps on it (every second counts when one is dusting and there must be no delay in reloading). By way of maintenance, they felt the universals from the fan to the agitator should be removed and one straight shaft installed. This would eliminate costly delays when the universals fail.

In the field it was agreed that the upper and lower doors should be taken off and thrown away. They want all the visibility possible and, secondly, even though the ship is placarded one-place, with the ample load-carrying capacity (doors removed) two people could easily ride the plane. This saves time in moving operations. The passenger sits on the door base and swings his legs in space.

They stated that the starter, battery, and generator systems would be removed in the field to save precious extra weight. With removal at the factory, this might save a little on the original price of $4,995. One man felt that the bottom venturi plates were too close to the ground and if he possessed the ship he would trim them up a little. They couldn't agree on whether or not the flap handle was too close to the hopper handle. Personally, I thought it a good idea to have them close together because a fellow keeps pretty busy when he is buzz-dusting. The hopper handle was not placarded and we wondered whether it should have been.

My co-check pilots were enthusiastic about the capacity of the hopper. The old outfits had nine cubic feet while this one has double that amount (721 pounds).

By way of physical description, the airplane is a single-place, high-wing cabin monoplane of steel tubular construction with fabric cover of Piper duraclad plastic finish which is noninflammable. It is powered with a Lycoming O-290-D engine developing 125 h.p. at 2,600 r.p.m. Of a soft Polar gray butyrate dope, the *Super Cub* is trimmed in bright Tennessee red. It has the same wings (US35B airfoil), cowl, gear, and tail group as the two-place model.

The fuselage has been considerably modified to contain the very large hopper. Formerly the hoppers were installed through the door, but this model has a flattened and reinforced turtle-back and structure. The hopper is attached at several points which are not noticed at first glance: at the top to the fuselage structure with 32 machine screws; through the middle with a tie rod; two strong channels across the front of the tank; and at the bottom the hopper extends through the structure, providing further restraint. The hopper angles back from the cabin to a filler lid on top-side. A square filler lid is attached to the fuselage with a wing-nut assembly on either side. The top deck plate in which the lid fits is a structural member.

The belly of the ship is covered with Alclad skin and Dzus fasteners permit quick entrance into the bottom of the fuselage for inspection and cleaning purposes. A three-bladed fan assembly with

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brake is located on the left side of the body and actuates the agitator in the hopper. A double-throated venturi with several channels suspends from the bottom of the hopper and is anchored there. Twin boxes with non-clogging, sliding control plates are positioned between the venturi and the hopper. These plates are controlled by the hopper lever in the cabin.

The panel, from left to right, consists of red-knobbed mixture control, tachometer, airspeed, compass, altimeter, oil pressure-temperature combination, and primer. The airspeed indicator is redlined at 138 m.p.h., and although like its older sister, the durable J-3 *Cub*, it probably can wind up a lot more with safety.

To the left of the seat is located the carburetor heat control, cabin heat lever, ignition switch, and trim tab crank. Forward of this is the fuel control handle with three settings—left tank, right tank, and "off." It is a big pointed lever with plenty of red on the tip so there can be no mistake. Blue-colored throttle knobs are located the same place as other Piper trainers. Two long arms, one just ahead of the other at the pilot's left knee, control flaps and hopper. On the right side, above the door, is the ampere meter, master and auxiliary switch. Provision is made for radio and light installation. On both upper side walls are visual glass gasoline quantity gauges and they are well marked.

Lateral visibility is the same as the conventional *Cub*. The front shield is large and adequate. A large skylight of ultra-violet absorbing plexiglas permits vision up and partially back.

As a safety feature, Piper has installed a rugged Air Force type seat belt, and best of all—adequate shoulder harness that has been tested up to 18G's. Both shoulder and seat harness can be adjusted quickly to different body sizes. Baggage is carried in a compact separate compartment under the hopper accessible from the outside of the airplane.

The airplane that I flew (N1627A) was the first one off the production line and is licensed under Part 8 of the C.A.R. It has a gross weight of 2,070 pounds, which may include a maximum 721 pound load. The conventional *Super Cub* is certificated as a two-place ship with 1,500 pound gross weight. The versatility of this model is shown in the fact that it may be (1) two-place conventional, private-pilot or trainer plane, (2) duster airplane, (3) sprayer job, (4) combination duster and sprayer (conversion accomplished in 1.5 man hours), and (5) single-seat cargo aircraft. Added to this, for $15.45 you can convert the Duster into a Seeder.

The spray rig calls for the same basic hopper system, but features a spray quantity gauge and a pressure regulator control. It has two suspended booms on which are positioned 24 spray nozzles. The booms are hinge-mounted so that if an obstacle is encountered, they will swing back 80°. The system pressure can be varied in the cockpit from ten pounds to 110 pounds. The Duster spreads from ten to 50 pounds per acre, while the Sprayer distributes from one-half to five gallons of the 110 gallon capacity for the same area. The factory reports coverages of over 50 feet at normal spraying height of about four feet and can spray 200 acres in 45 minutes. The Sprayer ready to work lists at $5,195.

To convert to a cargo job, one removes the rear seat or hopper, and installs a factory-made plywood deck. This provides sufficient space to enable the plane to carry up to a quarter ton of merchandise.

The Duster pilots at the Delray Beach strip agreed that Piper has created a fine special-purpose airplane. They were impressed with capacity, safety, visibility, maneuverability, and most of all—the reserve power. My opinion on the airplane as an airplane is that it would make an excellent primary trainer and liaison ship, as well as a duster-sprayer-cargo job. Performance-wise it does its work well. For pea-patch, strip, or high-altitude field flying, it would be hard to beat this plane. Like the Duster men, I like to have lots and lots of power and this aircraft has it. And the equipment on it is complete, even to the wire cutters on the landing gear, and the special venting of the fuselage.

Stearmans have not been made since the latter years of War II. They are becoming more and more scarce. The problem is slowly but surely arising as to what ship can be utilized when the Stearmans are extinct. Piper Aircraft has a fine solution in the PA-18A. END

Sierra Bob

(*Continued from page 25*)

have proved better than forecasts.

Occasionally a private flyer from Nevada or from southern California sets down on one of these fields. But for Sierra tenderfeet, there are smarter ways to spend a Sunday.

His present ship, the open cockpit Waco, is "just what the Sierras ordered." Bob has outfitted it with a 300 h.p. Lycoming, replacing the 220 h.p. Continental. A constant-speed prop has also been added. The front cockpit is rigged with a two-passenger seat which folds to the floor, giving a 36-cu. ft. cargo space when needed.

Some pilots, when they contemplate the "easy" life of a bush pilot, see dollar signs. Actually, Bob's rates are reasonable. He'll fly a charter back into one of the three strips for $25 a person, roundtrip. He usually carries two passengers at a time, each with the allowable 75 pounds of gear.

Charter season is limited in the Sierras from late spring until early fall. After that, the weather closes down, and even the rangers head for lower altitudes. Deer season is a financial bonanza. Time was when Bob charged $10 to bring out a buck. Now, as an inducement, he'll fly the deer out free. Scratching the $10 deer fee from his price list has enticed many a marginal charter to whom an extra $10 would have meant finding a cheaper way.

His air rates are competitive with the packers', and lower for trips into the more rugged Tunnel Meadow area. Surprisingly, there's some rough and tumble competition between the various services into the mountains.

Another bush pilot, chartering into these same strips could make more money, Bob admits. But to do it, he'd have to take back so many sportsmen that they'd soon fish and hunt the more accessible places thin.

"That would mean poor bags for most of my passengers and next year they'd find a better sports area," he says, realistically. So Bob tries to keep things in hand, staggers his flights where possible so that no more than 12 people are camping near any one strip.

These are some of the sobering facts which prospective charter pilots ought to know. Our remaining sporting areas are like a gold mine with limited potential. You've got to use some sense, else the vein will be mined out.

As one of Owens Valley's three or four licensed A and Es, Bob finds plenty of repair work wintertimes. He schemes to save up overhaul jobs until after winter shuts down his strips.

Back in 1944, after a stint as wartime instructor of fledgling Air Corps cadets, Bob migrated to Lone Pine. He promptly began exploring the airstrips, some of which had been in partial operation since 1930. Gradually, through the last seven years, his charter business has grown.

If a bush pilot builds his business solidly, he'll not just fly in a charter and leave him to fend for himself. A few old-timers at Sierra camping want to be left to their own devices. But most charters are novices who appreciate the wall tents, chairs and tables which Bob sets up every season nearby his strips. Bob lands, then sticks around to be sure his charters are set-up and happy. If a fisherman or hunter needs supplies in a hurry, he can call over the Forest Service phone which is linked with Bob's Lone Pine hangar. Bob will arrive an hour later with the order.

Sierra-meadow landing strips take a beating from nature. Avalanches conspire to blot them out; heavy rains convert them into wallows; gophers uproot them and fattening mountain cattle track back and forth, criss-crossing them with cow trails. Occasionally a strip's windsock disappears—and that leaves Bob with a full throttle and only his Sierra sense to go by. Even tougher are the one-way strips. You take-off down hill regardless of wind and come in for a landing uphill, with grades varying between one and three per cent.

The life of a free-lance mountain pilot suits Bob White fine. But you won't get rich, he says, not if you play square with your charters and with the available game supply. And supper—that's no problem at the White household. A half-hour after he's landed, he's got a creel full of fat trout. Another half hour and he noses down onto the Lone Pine strip, where Mrs. White waits with a smile.

In the Sierras, a fishing rod and luck are the bush pilot's best companions. END

CAN YOU SPOT THEM?

1 2 3 4 5

3 For 10

(*Continued from page 27*)

Then there was the airspeed picking on up, with the rate of climb recording 5,000 ft.p.m. I was at 10,000 feet by the time I had figured the whole thing out. We leveled off at 20,000. It was so quiet up there after the usual four fan-type engines banging in my cars. At first it seemed difficult to breathe. I was just a little scared.

"We dived a couple of times, rolled, then went back upstairs. It was smooth, quiet, and *fast*. We shot a couple of landings. You approach the field at 300, open your dive flaps, 60 per cent power (no tach readings in r.p.m.), 180° bank, and slow to 225. Your gear goes down, and you're 'in the green' on base. The formula for figuring final approach speeds is: (a) use basic figure of 130 m.p.h. plus (b) one-half the wind velocity, plus (c) five m.p.h. for every gallon of fuel left. (Some pilots add five miles for each child.) I thought I'd never touch the ground. The T-33s so low. Lieutenant Ohanesian kept talking me in, and I made it."

Student Worthington soloed in four hours, a usual average at Wichita. He was impressed with the sleekness of the craft, the design of the cockpit, the simplicity of starting and taxiing, and most of all—the speed.

Aerobatic flight is optional. However vertical stall recovery is stressed. Stalls are easy because there is no torque allowance. The spin is simple. In an inadvertent spin the student releases all controls and the Lockheed snaps right of it. The key in flying jets is to "stay way ahead of the airplane." In the conventional "fan-type" plane one stays two steps ahead but in jets you've got to be five steps ahead.

"There is no second guessing," Lieutenant Ohanesian laconically explains.

In forced landings from flame-outs the glide ratio is 18 to one. Thus the student can be as much as 50 miles from base at 20,000 feet and still make it. The technique requires decision to overshoot—aiming at the middle of the field, then slipping normally. The student is taught to fly with and without aileron boost. A little wart-like button on the stick controls the aircraft at higher speeds. This causes some little difficulty until the student gets used to it.

Seven and a half hours are allotted to solo and getting used to the T-33. Then follows one and a half hours of night soloing. The student is now ready for intensive flying—nine hours for day navigation, 15 hours of instrument work, and three hours of instrument navigation, including his graduation ride.

Wash-outs are rare because of the high calibre of the students. If the student cannot keep up with the airplane he is referred to two separate higher authorities before being eliminated.

★★★★★★★★★★★★★★★★★★★★★★★★★★★★

So far as is known, Capt. David G. Swinford of Santa Ana, Calif., is the first Marine flyer ever to capture a band of enemy guerillas. He began the operation in Korea by diving on a house and strafing it with 20-mm. fire. Some 50 Communist soldiers came tumbling out of doors and windows, waving white cloths and bowing. Flying low from time to time "to keep them in line," he herded them toward Marine lines. Captain Swinford then radioed ground forces, who put the finishing touches to the capture.

★★★★★★★★★★★★★★★★★★★★★★★★★★★★

In ground school, he works with instruments, hydraulic and electrical systems, navigational procedures, high altitude weather and cruise control. Emphasis is placed on the B-47 angle. He must know line checks just as well as a crew chief does. We spent 20 minutes of a frigid day watching a thorough inspection of the little T-33, and the B-47 is much larger.

Ground school also stresses high speed navigation. With check points 100 miles apart special charts must be used. Cruise control is a specialized subject allied with fuel management. Six General Electric engines can consume 15,000 gallons of fuel pretty fast. He learns about the "Totalizer," instruments which click like a set of false teeth while constantly showing the exact amount of fuel remaining.

He learns about Professor Mach and his numbers. The T-33 is red-lined at .8 of Mach (speed of sound). He must know the limitations of the craft. He must understand a series of red or green lights. As Capt. Carl Kosanke explained about the lights around the panel, "If those red lights start glowing, you'd better take inventory."

Each student learns the answers to the three basic problems of jet flying: (1) fuel consumption (cruise control), (2) rate of closure (acclimation to accelerated speeds), and (3) high altitude, high speed navigation. Jets as such are easy to fly. After a 50-minute familiarization ride Lieutenant Ohanesian felt he could solo me, a strictly lightplane pilot, in ten hours. To solo a T-33 in transitional training is one thing; to master it and the B-47 for combat work is another. They learn the problems that the fighter pilot has faced since World War II. The only difference seems to be that the potential B-47 pilot-team is also qualified and proficient in the theories of radar.

Qualifications for nonpilots for entrance to the Wichita school are usually these: (1) age less than 33, (2) any Reservist, or Regular with 500 multi-engine hours, (3) certificated during War II as navigator or bombardier. The prospective student is first sent to Mather Field, Calif., for ten months, then to Wichita. By this time he should be qualified with wings from bombardier, radar, and navigational school. I asked student (Lieutenant Colonel) Evans why he had chosen jet training.

"Why," he replied in a soft low voice, "the future of the Air Force is in jet bombardment . . . I'm glad to be aboard."

Upon graduation from Phase II, he joins his team and the three finish their training as a unit. These men are not geniuses nor "four-headed monsters," as they have been dubbed. They have received very high degrees from an Air Force "university." I should rather call them "D.J.s"—Doctors of Jetosophy. END

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THE MAIL BOX

T.O.E., NOT S.O.P.

I'd like to get in here with a little constructive criticism of pilots holding Instructor's Rating who are somewhat lacking in the essential *technique of explanation*, and an apparent lack of standardization among instructors. The CAA is attempting to remedy the latter, but the former will be best remedied by conscientious efforts of the instructors themselves.

I have about 3,000 hours total, very little of which is lightplane time. My first dual in a *Cub* was in 1935, under an excellent instructor. Subsequent occasional lightplane dual frequently proved to be a waste of time and money. Just as well sit at home on a kitchen chair coordinating a broomstick. Recently, I again have been subjecting myself to a bit of lightplane dual with varied and generally unsatisfactory results.

An instructor who substitutes "follow me through on the stick" for a good, clear explanation of a maneuver never fails to arouse my indignation. In a few cases, i.e., a full stall landing, something might be gained by noting stick displacement, but coordinated maneuvers are more of a "stick pressure" proposition. Ever hear of anybody learning to play a drum by holding his hand on the drumstick while the drummer beat the instrument?

I stoutly maintain that to be a good instructor a pilot must be able to explain clearly: (1) What is wrong with a maneuver executed by the student. (2) How the student can tell it is wrong. (3) What must be done to correct the fault.

In a recent booklet, Col. Roger Q. Williams states that flying is 75 per cent headwork and 25 per cent arm work. FLYING has been doing a lot of good work along this line, too. I believe that the seat of the pants is for sitting on, and the substitution of this part of the anatomy for the brain is a somewhat narrow attitude. I recently read of an ADF manufacturer who had one of his products returned because it failed to point North. I try to increase my lightplane proficiency by some dual, and what do I get?—"That Chandelle didn't feel right to the seat of my pants, follow me on the controls and I'll show you how it's done."

The above are my opinions and I'll wager many others have similar ideas. At any rate, it would be interesting to find out, and perhaps we could all learn something.

R. A. MACGREGOR

St. Paul, Minn.

YOU'RE NEVER TOO OLD

The news stories in FLYING of "oldsters" who are flying have been interesting. I'm wondering if we couldn't hear from all who have learned to fly when past 50.

All of this would be good promotion material against the time when the manufacturers may have to put a little more pressure on to sell planes than they are just now. The publicity directors of the different airplane manufacturing companies and AOPA's able department could press this through the newspapers. All would help to dispel the impression that flying is an art only for youngsters and supermen.

I learned to fly when I was 61, and, while I'm still flying on a student license, I'm hoping to get a private ticket by summer. I'm flying a Piper J-3 *Cub*.

How about some others past 50? What are they flying and what do they think about it? And how about pushing some of this publicity to break down the prejudices of those who say they "guess they'll keep their feet on the ground?"

ALBERT W. BAILEY

Elkton, Mich.

● *It's a tough haul, but we think that slowly people aren't worried about keeping their feet on the ground so much anymore.* FLYING *has been doing everything possible to prove that piloting can be as safe as walking—if done properly. We don't think there's any such thing as being too old to fly—how about you, readers?*—ED.

ARTICLE LAUDED

I would very much like to thank Vera Foster for her article "ADIZ," which appeared in the January issue of FLYING. The article certainly did more than merely explain the rules and regulations of the DVFR. It helped to create a better understanding of the new plan and, furthermore, encouraged all private pilots to give their fullest cooperation. There can only be complete success of this security plan if our country's airmen can be made to realize the importance of these regulations.

With writers like Vera Foster on the job, I am certain that we will have no recurrence of the grounding that occurred in the last war.

ARNOLD NEIS

Brooklyn, N. Y.

SO SAAB-Y

In the December issue of FLYING some facts about the Swedish Air Force were to be found in "The Mail Box." Mr. Dennis M. Powell of Prestwick, Scotland, told your readers of the worst accident that has happened to the Swedish Air Force, the crash of the Bristol *Wayfarer* in Italy on its return flight from ferrying SAAB-17 to Ethiopia.

The picture accompanying the letter, however, is not of a SAAB 17 but of a Swedish-designed fighter of the J 22 type. (J Stands for fighter in Swedish).

Above is a picture of the SAAB 17 (left) and the J 22 (right) to show the difference.

CAPT. IAN A. IACOBI
Swedish Air Force

Malmslatt, Sweden

MILES AHEAD

I was interested to read your comment on the speed of aircraft production here in the war, referring to the Westland *Lysander* being designed and built in 12 months flat.

I feel I must tell you of a feat performed by the Miles Aircraft Company in 1940 which makes one wonder what kept the *Lysander* so long.

In 1940, when a handful of *Hurricanes* and *Spitfires* were smashing the German's pride M.E.109, Miles decided that a utility fighter had to be built, but fast.

The result was the Miles M.20, an all-wood fighter boasting 12 guns, a speed coming between those of the *Spitfire* and *Hurricane*, but carrying more ammunition and having greater range than either.

From the conception of the idea to the first flight, the time elapsed was just nine weeks and two days.

Unfortunately, the Battle of Britain was won by the time the M.20 was ready and it never actually got into production.

A. G. GREEN

London, England

NOT SPINS BUT SPIRALS

Ed Houdley's article on stall-warning devices in the January issue was generally persuasive. He betrays a serious misconception, however, when he mentions the case of the pilot who gets caught "on instruments without instruments."

The non-instrument pilot caught in the clouds does not spin. This is so in spite of the fact that, often, when he has managed to live through the experience, he thinks that he did spin.

The maneuver he performs is actually a tight diving spiral. It develops a much higher airspeed than a spin; in the case of a "clean" airplane, the wings are eventually torn off. The spiral can be stopped at any time by stopping the turn. However, the pilot ordinarily does not know which way he is turning.

Any pilot who does not know this owes it to himself, his wife and children, and his insurance company to start believing it—now.

PRESTON DAVIS, JR.

Columbus, O.

● *For more on this and what is being done about it see "Spiral Dives Need an RX" by Don Dwiggins in this current issue.*—ED.

INTERNATIONAL EXCHANGE

I would very much like to exchange photos with a collector over on your side of the Atlantic.

I should be most interested to hear from a few collectors—preferably from California, Texas or Florida. I collect two and three quarter by four and one half size photos, and have a large file of negatives.

I am particularly interested in airline planes, racers and privately-built planes.

J. M. G. GRADIDGE

32 Meadow Way
Rickmansworth, Herts., England

BLAST FROM BRITAIN

I have been reading American publications for some years and FLYING in particular. It does not surprise me to read in these magazines that the American people are shocked by the various statements made about the superiority of the Russian MiG 15.

It seems to me the American publications have for years played down the technical achievements of countries outside America with the inevitable result.

Soon after the war ended technical magazines in this country gave details of German jet and rocket development, with the information that most of this research had been taken over by the Russians. Why, therefore, people should be so surprised at the way the Russians have developed these German (and English) designs is rather puzzling.

German brilliance in engineering has long been known throughout Europe. It seems logical then that as British and German jet developments were in roughly the same state at the end of the war, Russia should have a temporary superiority —taking into account the fact she has been rearming steadily since the war ended—whereas the Western Powers were steadily disarming.

America shows remarkable lack of initiative in that since 1942, British engineers have sent a constant flow of information on jets to American factories and, yet, it is only during the past two or three years that you realized the terrific possibilities of this type of propulsion.

In the December FLYING reference is made to the fact that America ignored German developments in this field particularly prop jets. It would seem you also ignored British developments, as well.

Britain and Germany were the pioneers in jet development, America's first introduction to jets being the Whittle sent over in about 1942. It is with rather amused anger that I read the article "Britain's Bid for Air Supremacy." Just how important that *bid* is should be judged from the fact that without the information Britain's jet manufacturers have supplied during the past ten or 11 years, American aircraft would be just that much more behind Britain and Russia.

It has yet to be proved British engines are not the best in the world, perhaps that is why you will not allow inspection of the MiG captured intact; spotted, incidentally, by a British carrier aircraft.

A. D. ARKLEY

Middlesex, England

DETAILS ON DELTAS

On page 31 of your December issue, it is stated that: "Great Britain is testing two Delta Wings."

This is untrue. We in Britain are proud of our Deltas and at the moment we have five on test.

The first of these Deltas to fly was the Avro 707 in September, 1949, which unfortunately crashed a short time later. In September, 1950, the 707B made its maiden flight to be followed by the 707A in 1951.

In addition to these two beautiful aircraft, two other research Deltas are in existence—the Boulton Paul 111 which first flew in October, 1950 and the Fairey F.D.1 which made its first flight in March of last year.

To add to the above planes came the Gloster G.A.5 twin-jet Delta wing fighter. It represents a lot of Hawker-Siddeley research and is the first multi-purpose fighter of its kind to be ordered for the RAF. It first flew in November 26 and with its two Sapphire engines, it should prove to be the most powerful and unusual shaped aircraft the RAF has ever had.

J. ROBERTSON

North Devon, England.

Problems and Answers

(*Continued from page* 15)

Q. We hear complaints about the shortage of aluminum in the aircraft industry. What's the explanation for this shortage in view of the great production achieved in World War II?

A. There has been *no real shortage of aluminum*, insofar as the aircraft industry is concerned. Some temporary difficulties have been reported, but spot assistance has been provided by NPA in all known cases. Naturally, we haven't been able to grant unlimited allotments, because the demand for aluminum has expanded even faster than supply.

Q. Has the Government encouraged the aluminum industry to expand sufficiently rapidly by tax amortization and other incentive measures?

A. The Government has given all possible assistance in expanding aluminum production.

Q. Is there any evidence of a black market developing in aluminum?

A. Not to our knowledge. An aircraft manufacturer is able to get and place CMP tickets to cover his defense production requirements fully.

Q. Are you able to keep sufficiently close check on inventories at the various aircraft factories to insure proper distribution of aluminum?

A. In general, yes, although it is a continuing problem for us and for the plants, because of the many different forms and shapes involved.

Q. Has the airplane industry been able to recover the skilled personnel developed during World War II?

A. There has been no real problem on this score, except in a few areas. The labor demand in the aircraft industry is still far below World War II as to total number, but the *nature of today's planes calls for many new skills* which were unknown at the end of World War II.

Q. Have women been recruited into aircraft factories in any great number?

A. Not to the degree experienced in World War II. For one thing, there are still a number of men around. The work force in aircraft factories will still be less than one-third as large in April 1952 as at the peak of World War II.

Q. Are women able to handle the increased technical problems involved in modern aircraft?

A. Shall we be diplomatic and paraphrase an old expression, "Never underestimate the 'ability' of a woman." Certainly, there are many jobs in aircraft production that can be performed by women, as in World War II. In addition there are a number of qualified and expert women engineers. In the drafting room, trained women are unexcelled as tracers and detailers, and not infrequently, a number qualify as designers. END

Deep Freeze

(Continued from page 33)

drivers accustomed to making the trip several times a day have become lost, to wander around for hours in a circle. Then there is the added problem of fleeting light. The sun plays hide-and-seek below the horizon for four long months, and land, sea and air are blended into a single mass—like a pail of milk, and with the same opaque consistency.

No radar, no ground controlled approach systems or other electronic navigation aids exist north of the Brooks Range. The radio fades out, skips and plays other tricks to render two homing beacons of doubtful value. Navigation always is the big problem, the eternal question. The pilots must depend upon their own cunning bred of experience. They constantly search for odd-shaped drifts, the good and bad ice in case they have to come down, an oil drum discarded by an exploration party, an exposed ridge on the shore of a frozen lake. All are makeshift signposts. For example, Transocean pilots were the first to discover that every one of the scores of large lakes north of the Brook Range has a straight side which points directly to Point Barrow. This information has been of great value to the 3,500 whites and Eskimos living in the region embraced by the Reserve.

With the cold and darkness of the long winter at Point Barrow, every move requires extra effort. The bush pilots and ground crews get out of their bunks in darkness, aroused by the wail of a siren which officially proclaims whether it is day or night. Pilots struggle into their heavily padded Arctic flying suits which are tiresome just to wear, then brave the cold for a dash to the mess hall. If it is to be a routine flight, the pilot and his passengers lift themselves, or are pushed up, into a weasel, the faithful caterpillar truck essential to the deep freeze country, and lumber off to where their plane is tied down on the ice.

The first chore is to make sure of emergency equipment and rations for 30 days and that all making the flight have sleeping bags and other survival gear. The emergency supplies carried by each bush plane weigh over 250 pounds, but nobody in his right mind would try to trim that load.

The next task is to scrape the snow off the wings. A rope is looped over the wings and then pulled along the surface with a sawing motion. Next, if the flight is originating from an outlying camp, the pilot has to do his own fueling. This means chopping a drum of gasoline out of the ice, rolling it alongside the plane and hand-pumping the contents into the tanks. Then the engine must be preheated. A few of the camps have the long-snouted heating devices developed for the military. Lacking this, the pilot must do the heating with the firepot in his emergency kit. There is a fine point in this operation beyond which the aircraft bursts into flames.

His engine heated, the pilot climbs into the cockpit (no small task in itself, the aircraft designers never having envisioned a man's bulk in Arctic flying gear). The engine is then started and warmed to operating temperature. At that point, it is certain that the skis are frozen in the ice. To release them calls for rocking the controls fore and aft and spinning the prop at full throttle. If that fails, the last man aboard is asked to brave the icy blast and give the tail a healthy, sidewise heave. Once the skis break loose, the aircraft must be kept in motion or it will freeze in again. This makes the job of getting back aboard very tough for the tail pusher.

Next comes a swoosh out onto the ice to pick a reasonably clear area for takeoff, where the drifting snow cannot reach out and trip one or both skis at the critical moment of leaving ground. Frequently the plane makes several runs up and down the ice to smooth out a path. A fast run marked by decreasing bumps, the deep-throated, exultant sound of an aircraft entering its element, and the flight is airborne.

Cruising altitude for bush flying is reached almost immediately—100 feet above the terrain. No need to go higher. It is all flat and there is no tree for hundreds of miles. Ahead and all the way around the circle of vision lie snow and ice—a mottled pattern of frozen rings, faintly outlined by the tundra grass. Everywhere the pattern is the same, but the pilot, relying solely on his own system of observation and know-how, heads unerringly toward his destination, be it east to Oumalik, Topagoruk, Simpson Seeps, or exploring a new area out of Oumalik, Skull Cliff, Barter Island far to the east, or one of the other goals.

There is no real daylight, just a faint glimmer on the horizon. The plane carrying this writer seems to be hanging in a soft white blanket. A herd of caribou and reindeer whizzes by, and a note is made of the location to be passed on to the Eskimos at Barrow. These herds are the principal source of food for the natives. The presence of a pack of wolves stalking the herd also is noted. Too bad there is no time to hunt them down from the air, and collect some of that $50 bounty for each one brought in.

Then some Eskimos fishing through the ice appear out of nowhere. Alongside are the skin tents in which they live. The pilot waves a greeting and he gets enthusiastic waves from below, which assure him that all is well. Knowing the uncanny accuracy of these pilots in navigating the Arctic, the Eskimos stay fairly close to the air routes while hunting food. When one of them is injured or taken sick, or they need supplies, they head for the nearest oil camp so that the next plane can feed them or take out the patient.

From time to time the pilot glances at his watch, then peers more intently than ever into the nothingness below. His eyes fasten on an almost undiscernible strip of earth which has been cleared by the wind. Experience has taught that this is the bank of a river which is the pilot's check point. Soon a black finger looms ahead. It quickly expands into a frontier oil camp—a collection of quonset huts, wanigans, which are huts on runners, and a board walk topped by a lofty, tarpaulin-covered oil derrick. With a fast circle to check conditions and pick up wind direction from the way the snow is blowing, the pilot comes in for a soft landing alongside camp. No matter what the hour, willing hands are there to meet the plane.

First off, with the passengers, is the mail, then films provided by the armed forces picture service, followed by the food and supplies. On our trip the food included several cans of ice cream and two cases of California oranges.

Everyone in the camp knows the Transocean pilots, and the time passes pleasantly during the stop. Due to the vagaries of the radio waves, the camps get only skimpy news and that from a station in French Africa. The first questions are about what's doing in the States and how the Korean war is going. Big-time baseball and football are subjects of special interest to holders of numbers in the $500 weekly pools. Elections are of minor interest. The men in these camps are hungry for movies. They work 12-hour shifts seven days a week, and within minutes after the plane lands the off-duty crew has a show going in the section of a quonset that serves as a recreation hall. Everyone has to see every film, and frequently this means as many as five showings in one night, or day. This can be rather boring for the visitors when the weather forces them to stay over, and they are put up in the usual spot, the recreation hall. There always is a solitaire deck, and one can tell from the feel of the cards whether the camp has struck oil, and if so, what quality.

For the return flight the plane is loaded with oil samples, ores, films, mail and machinery sent back for exchange or repair. Also taken on the return flights are the workers headed for a breather in the "Banana Belt," which is any place south of the Brooks Range. For the oil men this is a womanless land. They are urged to fly out for a holiday every three months and requested to do so in six.

If the flight is to Skuil Cliff down the coast, and time permits, the pilot flies over the memorial to Will Rogers and Wiley Post, nine miles south of Barrow, and dips his wings in tribute to those beloved victims of Arctic weather.

Back at Point Barrow, the pilot warms his hands at the pot-bellied stove in the airport office while his plane is loaded again, and then takes off on another flight. His race with the fleeting light, to get back to the base before total darkness, adds suspense to the work. The whole camp at Point Barrow feels it, and every-

★★★★★★★★★★★★★★★★★★★★★★★★★★★★

FLYING ANTS

The script of the latest Tarzan film called for a close-up of ants crawling over Tarzan's hand. But plain old California ants wouldn't do. The studio promptly cabled to Nairobi, Africa, for a box of genuine Dark Continent insects. They arrived by air along with charges totaling $35—making them probably the most expensive ants in history.

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body is happy when all the planes come in on schedule.

Mercy flights are many. Besides providing protecting wings for the Arctic Eskimos and the military and civilian personnel on the Petroleum Reserve, Transocean's pilots afford the nearest aid should misfortune befall the U. S. Air Force planes on their thrice-weekly "Operation Ptarmigan" weather flight over the North Pole, and to the observation posts along the Arctic Ocean.

Last winter, the linehaul pilots noted with increasing concern that the tribe of mountain Eskimos in windy Anatuvuk Pass was not making contact with the caribou herds. Investigation by a ground party revealed that the tribe was badly in need of food; on the next flight, a supply of rice, powdered milk and whale meat was dropped. The spread of a polio epidemic among the Eskimos always is a source of worry to the airmen.

One of the routine missions during the darkest winter months is the dropping of red guide flags ahead of the "cat" trains that transport heavy construction equipment and materiel to a few of the outlying camps. These flags mark the course for the 100-ton trains and must be spotted with 100 per cent accuracy, or an entire train may be sent plunging through the ice. The pilots thus far have a perfect record for marksmanship.

Another year-round routine mission is to deliver a box of flowers every week to a carpenter at Oumalik. The flowers are flown in from Seattle. Questioned one day after delivery of some long-stemmed hot house roses in an Arctic blizzard, the carpenter heatedly answered, "I like flowers, that's why!"

There are no bouquets for forced landings hundreds of miles from the nearest habitation, to wait out weather or repair mechanical trouble, and they are common occurrences. When this happens the pilots methodically go about the task of keeping warm and sustaining life until the weather lifts, or help comes. If it has to happen, they hope they will have passengers with them. The pilots are a lonely lot, and they like company. To keep warm, they heat up the cabin of the plane with the firepot, a ticklish deal. They lay out the signal equipment for instant use if another plane is heard. The emergency rations are then broken open and doled out as the need arises.

Maintenance of aircraft in the Arctic is a major problem, what with the sub-zero temperatures, freezing fingers, limited shelter and difficulty in obtaining an adequate supply of repair parts. The mechanics are cut out of the same cloth as the pilots. They endure great hardships —work night and day to keep 'em flying. When they run the planes into the lone hangar to escape the bitter cold, the weight of the plane and the heat used in the repair work melt the permafrost, and the hangar floor sinks. So they have to build a new floor to bring the hangar up to the level of the ice. And so it goes. They have to be ingenious too—like the time last summer when one of the planes suffered a punctured float. Repair equipment was not available and rush flights had to be made. So they gathered up some inner tubes, crammed them into the gaping hole, and inflated them. The result was perfect buoyancy.

During off-hours the Transocean crews while away the time taking in the nightly movie or playing cards. When one of them is down on the ice, the others are glum, and talk little. The refreshment ration is five cans of beer a week doled out every Saturday night. When transportation is available, they drive down the shore of the Arctic Ocean to the village of Barrow two miles away, the largest of the Eskimo settlements, about 900 inhabitants. Despite an increasing number of wooden houses, it still is a primitive village with such facilities as a municipal water plant which consists of slabs of ice carved from the fresh water lake, dragged in by dog team and piled in the "civic center." When a villager wants water, he lugs a slab into his home, tosses it into a wash boiler on the stove and waits patiently.

In Barrow, the airmen are greeted warmly and usually showered with shopping lists. The Eskimos working on the Reserve earn good money and their first desire is for American things—furniture, new fangled stoves, kitchen equipment and the like. One wants a television set and refuses to be talked out of it, though it would be useless there.

The pilots themselves are always dreaming about the day their ship will come in, "when I'll have it made," as they say over and over again. Most of them long to retire to the peaceful, scenic Kenai Peninsula near Anchorage. Each has a secret plan for "making it," but most of them admit their lone hope is to win the fabulous Ice Pool.

Because of the rotation plan of quarterly holidays in the "Banana Belt" the roster of the Transocean crews is constantly changing, but always the spirit, the airlift and the humanitarian work continue at the same high level. Many of the crews come in from Transocean's other bases around the world, some of them from the boiling 120-degree heat of operations in the tropics.

The roster during the writer's visit included the general manager of the operation, energetic William Leonard Word, Missouri-born veteran of extensive service with the Air Transport Command in World War II, and of Transocean's round-the-world operations; supervisor of the bush flying, Ken Armstrong, New Jersey-born former trick roper, rider with the rodeo circuit and veteran of 15 years bush flying in Alaska. He calls Dillingham in the Bristol Bay area his home. Dick Armstrong, 19, Ken's son and the youngest of the pilots, flies a Stinson and is a crack shot at bagging wolves from the air. Earl "Red" Dodge was a Navy combat pilot in World War II and is a veteran of five years bush flying in the Anchorage area. Irving Crain, Canadian from Churchill in the Hudson Bay Region, has been flying the bush for 10 years. Curly Martin, from California, has had 15 years of bush flying in Alaska. Curtis Hoxworth, from the State of Washington, has had five years in the bush; and Homer Williams, Pennsylvania, 10 years at bush flying.

Francis Kennedy, ex-Navy, worked his way up from mechanic ranks to a top pilot on the '46's. Russ W. Steinhauer is an Air Force veteran from San Francisco. Danny Ackerson, from Salinas, California, saw combat service on a destroyer during the war and won his pilot's license during a 30-day shore leave. Henry Dodson, from Seattle, flew the Aleutian front during the war. E. H. Jock Johnson is a 6 feet, 4 inches-tall veteran of the Royal Canadian Air Force. Maurice Carlson is a war veteran with five years of peacetime flying in Alaska.

Bob Warren, of Fairbanks, is another Alaskan veteran. Cyril Seeds, from Nome, is a colorful veteran with 15 years of bush flying, much of it in the Arctic Circle. He has been down on the ice so many times he has learned to like the emergency rations. Eddie Bonzo is an ex-Air Force pilot from Pennsylvania by way of California. Chief Mechanic Fred Whitmire, has had 12 years of experience in Alaska.

As if the problems of the Arctic were not enough, some of the pilots have difficulty keeping the "little woman" happy by remote control. When a sudden storm and a crackup in an attempted landing left one of them marooned on the ice, with the prospect of a long stay in sub-zero temperature, his wife in Fairbanks was notified by a linehaul pilot who phoned her. "That's a damned good place for him!" she snapped, and hung up the receiver. END

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"AOPA IS DOING A MARVELOUS JOB FOR THE CIVILIAN PILOT"

Says R. P. MILLS
AOPA Member A73593

I am very enthusiastic about AOPA and the work you are doing, and there is nothing that I can say that would fully describe my appreciation. I have belonged to a number of organizations over the years, and have never found any that had the interests of the members at heart the way you fellows do. You are certainly doing a marvelous job for the civilian pilot, and membership would be cheap even at $50.00 a year. Keep up the good work.

AOPA Member R. P. Mills, who holds both U. S. and Canadian pilots' certificates, is president and managing director of numerous Canadian mining developments. His work requires constant visits and inspections of mining properties, the majority of which are located in Northern Quebec. Mr. Mills says, "A good deal of my flying is known as 'bush' work, and as there are no landing strips or airports north of Montreal, an amphibian is the only suitable type of plane." He owns two Seabees, N6360K and CF-GPV, one of which is shown in inset. He uses one of these when traveling from his home in Freeport, N. Y. to his office in Montreal, and comments that the work that AOPA did to help streamline the flight plan and Customs' procedure in crossing the border has made his flying easier.

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NOTES ON CIVIL FLYING

Words From CAA

The Airworthiness Directive Summary issued annually by the CAA hereafter will be sold through the Government Printing Office. CAA Airworthiness Directives, issued every two weeks, will be distributed free, as in the past, but the 1952 Summary will be sold for $1.50 by the Superintendent of Documents, U. S. Government Printing Office.

The 1950 edition of the CAA Statistical Handbook of Civil Aviation now is available from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. at 50 cents a copy. This new edition contains all available civil aviation statistics through December of 1950, and those pertaining to scheduled aviation are based upon data supplied by the Civil Aeronautics Board.

Increased requirements in the flight examination of private pilots have prompted the CAA, U. S. Department of Commerce, to allow designated examiners to charge more for their services in giving such flight tests. Examinations given by the CAA's Aviation Safety Agents, however, will still be given without cost and by appointment as the agent travels through his district on a definite itinerary.

New Seat Tank Unit

A Seat Tank Unit for Super Cubs and Aeronca Champions has been added to the line of Sorensen Sprayers. Fully tested and approved by CAA as a Seat and a Tank, it allows the pilot to carry his own flagman or to fly the farmer on an inspection tour of his fields. An important feature of the Seat Tank is that it can be left in the aircraft permanently. It is strong, comfortable and roomier than the aircraft's regular seat, and carries 53 gallons. An auxiliary tank carrying an additional 20 gallons has also been designed and can be attached to the new Seat Tank.

Minimizing Red Tape

A new and painless border-crossing procedure called "pre-clearance" has been developed for airline passengers between points in Canada and the U. S. in order to cut down on international red tape. Under its provisions, passengers from Canada to the U. S. are being cleared through U. S. customs and immigration formalities before their planes take off from Canada. IATA is urging that the process be instituted at such major traffic centers as London and Paris.

College Aviation

The country's first college correspondence course in aviation has been announced by the University of Illinois. It is designed specifically for flyers who received private pilot licenses between 1945 and last August with only sketchy ground-school training, and for others interested in flying but without available ground schools.

The need for such a course was provoked by increasingly stringent federal pilot licensing regulations in effect since last August, requiring knowledge about civil air regulations, meteorology, aerial navigation, radio, and the general service of aircraft. Also, private pilots licensed earlier, often with little more skill than how to get off the ground and back down without accident, have found a need for this information in order to get the most use out of their airplanes.

At the City College Midtown Business Center, a new course called, "Air Cargo Transportation" is being offered to help persons engaged in air cargo transportation meet the demands created by the tremendous increase in traffic. It is planned to equip those now in the field to assume new responsibilities and also to train other persons interested in answering the growing demand for personnel.

The course will cover the history of air cargo transportation, types of service, regulatory bodies and regulations, industry organizations, rates, traffic procedure, cargo handling, and types of air cargo employment, and will stress the probable future of air transportation.

In keeping with the established policy of the Midtown Business Center, the course will be highly practical and will be taught by executives from the field.

Fire Detector For Aircraft

The CAA has just approved a sensitive, error-free, automatic, fire detecting device for installation in commercial aircraft. The equipment has completed qualification tests by the U. S. Air Force and the Bureau of Aeronautics for use on military aircraft, and is now in production by Walter Kidde & Co., Inc.

The system comprises a continuous, wire-like, fire-sensing element connected at one end to a monitoring control unit, which in turn provides the power for the system and the electronic circuit for actuating audible and/or visible alarms, located on the pilot's instrument panel. The other terminal of the sensing element is connected to a relay circuit for pre-flight and in-flight testing.

Pilots Post

American Legion Pilot's Post 963 of Philadelphia, Pa. boasts of being the only Legion Post in the United States whose membership requirement includes a currently effective pilot license in the grade of private pilot or better.

Pilots Post, with a present membership of 150 veterans from all service branches, makes its home at Buehl Field, two miles east by north of Philadelphia's Northern Municipal Field. The Post operates its own Civil Air Patrol unit.

Eligibility for Post membership does not depend upon former service in an air unit but upon current flying activity. Post Commander Joseph Simcock, former Navy airman, heads the outfit while Jack Devins, former Army Air Force instructor and Chairman of the State Legion Aeronautics Committee is the membership spark plug.

Pilot's Post wants all eligible for membership to feel free to make application. The welcome mat of the Post Home on Buehl Field is always out.

Air Drop

(Continued from page 23)

tested and perfected by constant practice air drops. Specialists of the 8081st Army unit, working in conjunction with teams from Combat Cargo, designed special parachute harness and allied equipment to handle such big items. The 8081st has supplied loading and packing teams to the Combat Cargo groups.

The apparent ease with which flights of C-119 *Flying Boxcars* have parachuted supplies and equipment to small drop zones belies the highly coordinated process by which sorely needed ammunition or other items of supply are sped to fighting men. In an emergency, priority rating will speed an original request through channels and bring about 24-hour-a-day operation until the emergency passes.

"In the Battle of Bastogne," says one 314th Troop Carrier Group staff officer, "we flew 1,000 missions with assorted types of aircraft to drop the same tonnage of supplies which 68 of our C-119s can now unload in a single drop. We are now able to drop a five-ton load in three seconds. If 68 aircraft drop simultaneously, we can put 340 tons of supplies on the ground in three seconds."

Drops are made even under the most adverse of weather conditions. Once, when fierce snowstorms prevented drop planes from seeing the flare-lighted drop zone of a surrounded French unit, a C-119 flew for two hours with lights, guided by radio control, to show the way for 36 other planes to drop the badly-needed equipment. The makeshift beacon did the job.

On March 23 of last year, as UN forces began to roll back the Communist tide toward the 38th, the biggest air drop of men and supplies occurred. One hundred and forty-five cargo planes were utilized in "Operations Tomahawk" to drop more than 4,000 paratroopers, two companies of Rangers and hundreds of tons of heavy equipment and supplies at Munsan, 15 miles northwest of Seoul, to trap retreating Red forces in that area. Only one plane was lost.

Air drops are not made only in the face of enemy fire. They have proven their worth when UN forces have been separated from their normal supply centers by flooding rivers or heavy snows and mud. And, as sometimes happens, a task force will move ahead more quickly than usual and engineer battalions cannot build roads fast enough to give them immediate and complete supply. Air drop then too springs the trap.

The advance of one U. S. Corps along the Wonju-Chungju corridor last winter was an excellent case of supply by air. The roads were useless and rail lines were out. Constant supply by air was the only solution. It enabled the corps to reach its objectives while normal surface supply routes were being restored and others were being established to keep up with the advance.

Opening of the peace talks at Kaesong on July 10 somewhat relieved the pressures on the air drop crews and planes. Aircraft not used on resupply missions were given intensive operational training in air dropping heavy equipment and paratroopers of the 187th Regimental Combat Team as well as other Army units.

The 315th Air Division (Combat Cargo) is commanded by the youngest general officer in the armed forces, Brig. Gen. John P. Henebry. It is his job to coordinate all air drop and air lift operations of the Division. He took over more than a year ago when the Division's original commander, Major Gen. William H. Tunner was recalled to Washington. General Henebry was his vice commander. He built a brilliant World War II record as a combat pilot and commander with more than 700 combat hours and 280 combat missions to his credit. He arrived in the Far East as commander of the 437th Troop Carrier Wing.

It is estimated that in the first operational year of its life, Combat Cargo dropped approximately 300,000 tons of cargo.

The advancement of air drop and parachute resupply techniques to the present efficient status has provided ground commanders in Korea with advantages that may well have made the difference between victory and defeat. END

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Tracking the Bird

(Continued from page 11)

systems are observing the "bird's" flight. Photo-theodolites—German-developed Askanias—are turning, recording on film valuable and precise position and attitude data. However, being optical devices, they are restricted to short ranges, but do play an important role in providing flight characteristic information during the launching and terminal phases of the flight-test.

Another method can plot the missile's position within a matter of a few feet. Called Raydist, this system uses the triangulation principle, which consists of a transmitter in the "bird" and three ground receiving stations. The distance from the missile to the receivers is computed from transmitted signals plus a triangulation factor, thereby indicating its exact position.

Returning to the tracking radars, we find that Jupiter Auxiliary AFB, 20 miles north of West Palm Beach, has reported to the Canaveral IFSO that they have a good plot on the "bird."

Normally, Canaveral passes the in-flight safety function to Grand Bahama, the first down-range island station, with Jupiter sitting in-between to augment the position recordings.

On flies the missile with steely and expressionless eyes casting their electronic stares from two distant sources.

What if the "bird" should suddenly veer from its path, set its beak on a course to the heavily-populated eastern coastline of Florida and become a potential warbird of destruction? Such will not be the case for two reasons: (1) missiles launched by the AFMTC will not carry warheads, that section instead being devoted to instrumentation and (2) the IFSO, by pressing a button and a resulting transmitted signal, can destroy the missile at any point, its broken remains falling harmlessly to sea.

Quoting General Richardson: "We have a big job to accomplish here at the Test Center, but none is so great that we cannot give first consideration to the protection of life and property within and without the confines of our range."

Of course, the In-Flight Safety Officer knows exactly those confines. In addition to the desired course line on the charts of his plotting boards, four lines, two on each side, run parallel to the course line and of a radius of a certain number of miles. Should the "bird" deviate from the course line and reach either of the two inner lines, called the destruct lines, it will be destroyed. The debris from destruction then must fall within the inner and outer lines, the outer lines being termed the impact lines.

Destruction of the "bird"—just enough to destroy its flying characteristics—is made possible by the detonation of lengths of primer cord, actuated by a small radio receiver within the missile. And in the event there is a malfunction in this destruct system, which would leave the IFSO powerless to do away with the missile, a "fail-safe" feature is provided whereby the missile is destroyed automatically. Furthermore, if all else fails, destruction can be accomplished by turning off the tracking radars. This also means that if a radar should fail, and a resulting loss of position information, the missile is automatically destroyed. No chances are taken. It is hard and bound AFMTC policy that once contact is lost, destruction is the next course of action. Hide and seek plays no part in the game of "tracking the bird."

Assuming that the missile in question has been guided back to on-course and destruction was not necessary, it is found that a third set of eyes have managed to get into the act. Grand Bahama Auxiliary AFB, located on the first island of the vast 100,000 square mile test range, has been ready since the timing countdown commenced at Canaveral. With electronic eyes focused, military and civilian technicians of Grand Bahama are set to receive the "bird." Telemetry units—capable of measuring the performance of the on-rushing target—patiently await to pick-up the first transmitted data from the missile.

"You have the 'bird'," barks the safety officer from the mainland, after confirming Grand Bahama's plot. Control changes hands as the pilotless aircraft enters its island-hopping phase. And so it will many times, always positive and firm, when all down-range stations become operational.

The flight represents another step forward in the Air Force's expanding research and development program. A multitude of data has been made available to the missile contractor for evaluation, providing him with a basis for improvement on his current project and know-how for "birds" of the future.

The Armed Force's largest controlled and instrumented test range is operated and maintained by the 6541st Missile Test Wing of the AFMTC. It is commanded by enthusiastic and energetic Col. Harold W. Norton who possesses extensive missile experience from a prior assignment at Holloman AFB in New Mexico, now a part of the Air Force Missile Test Center. In addition to the tracking stations mentioned previously, the Missile Test Wing will operate stations at Eleuthera, San Salvador, Mayaguana, all in the Bahamas, Grand Turk in the Caicos Islands, the Dominican Republic and Puerto Rico.

The outcome of future wars, if fate so dictates, might well be determined by tests now being conducted over the same placid tropical waters that Christopher Columbus discovered 460 years ago. "Tracking the bird" in 1492 meant that progressive man was about to make landfall; in 1952 the same is indicative of mankind's continuing quest for knowledge and advancement. END

15 YEARS AGO

FROM the April, 1937 issue of this magazine.

Westland "Lysander," an ultra-modern army cooperation plane, is designed for aerial duties in liaison with the Army, including artillery-spotting, reconnaissance and photography. New machine

is a high-wing monoplane with enclosed cabin for pilot and observer. Wings are tapered towards the tips and are fitted with Handley Page automatic wing slots and flaps to enable plane to land slowly and to ascend from small field.

Old umbrella type helicopter lifts from the ground with speed of an automatic cocktail shaker—at the same time re-

volving. At the desired altitude the pilot tilts the propeller at an angle, so that it not only lifts on its down stroke, but pulls forward also. Landing is accomplished by throttling the motor with umbrella pointed straight up, in sort of parachute fashion.

Government assistance in the development of private aviation in France is to be considerably expanded during 1937. The government program, which includes intensive theoretical and practical instruction for young men will be carried on through the various aeronautical clubs. According to the plan, clubs participating in the popular aviation program will be supplied with planes without cost and credits will be allotted for the upkeep of flying equipment and the training of students.

United Air Lines points out that, at any given time, there are never less than nine company planes in flight some place over the United States, and at certain times during the day there are as many as 20 planes in the air.

Saroleo engines have put out two new models, a smaller engine delivering 25 h.p. at 3,000 r.p.m. and a larger one giving 32 h.p. at 2750 r.p.m. The engines follow motorcycle engine lines in some respects, but their construction really conforms to most modern practices employed in building more powerful types of aircraft engines.

LOGGING TIME

WITH HY SHERIDAN

Captain, American Airlines

DIRECTION FINDING

Walking through a park on the south side of Chicago—I was walking instead of riding because I wanted the exercise—and I got mixed up in direction because of the curving paths. I wasn't sure, but I had an idea that I was at the moment heading back the way I had came from, so when I saw an old man leisurely smoking a huge pipe I stopped and asked him: "Sir, would you be kind enough to tell me how I should go to the University of Chicago?"

"Yes," he replied, "ignorant."

* * *

DEFINITIONS

Dimple. A depression that cures yours.

Commercials. Exhortations that we don't listen to to find out what we need not buy that we don't want if we could remember the name.

War. Lull between peaces.

* * *

NOSE-Y NEWS

The DC-7 is a DC-6 with the nose pulled out twice or a DC-6B's nose is pulled out once. We are looking forward to the DC-7B. What we will nickname it I don't know. The DC-6B is the "Durante," of course.

* * *

POOF-PROOF

It's not so much that airplanes are not fool-proof, as that fools are not airplane-proof.

* * *

COMPLEX COMPOUND

American Airlines just bought a covey of new airliners, called the DC-7. It is not a jet. It is powered by what is known as the compound engine. The compound engine is about as complicated as a woman.

It is a piston engine, but instead of letting exhaust gases go directly to the open air, these gases are piped into turbines which are geared to the crank shaft.

"We use everything," an engineer said, "except the squawks."

* * *

DUCK THE DUCKS

Ducks don't. That is, they don't duck. Once in a while a pilot gets duck-pussed. I have it from men with personal experience that the part of the duck that first makes contact with your face is not the tastiest part.

Keep your eyes open during the migrating season. It might be well to keep your mouth closed, but that is a matter of personal taste—so to speak. Anyhow, keep your eyes open, especially if you have a fast airplane. A duck can hit pretty hard.

One came through the windshield of a DC-3 and caved in the cabin door beyond the baggage bins. Besides, you can never tell when you have a Game Warden on board.

* * *

CEILING UNLIMITED

A woman passenger asked Sadie the Stewardess: "We're pretty high, aren't we?"

"Quite high," Sadie answered.

"Oh," the passenger said, "I thought we were higher than that."

* * *

SOFT SOAPING . . .

One of our captains has a son in grammar school and last Christmas the lad wanted to give his best girl a nice and truly feminine present.

He sent a present, all right, with the following frank and candid note:

"I wanted to get you a bottle of perfume like ma has but I didn't have enough money so I got you this soap."

* * *

HOW TO BE HAPPY

I have solved the problem of how to be happy though a pilot. When there is ice, I am glad that there are not thunderstorms and when there are thunderstorms I am glad that there is no ice.

The American taxpayer should start right now to practice this system of thought. It won't be long now until some other citizen will say to him:

"It doesn't seem that I have been able to afford anything to eat for six months."

"Well," you reply, "be thankful that you don't have indigestion."

* * *

Suggested motto for the wives of Canadian pilots:

A bird in the hand is worth two in the bush.

* * *

EPITAPH

He flew by the seat of his pants.
'Twas the wrong end.

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Look Before . . .

(*Continued from page 19*)

make a pre-flight checklist. We might be better off, too, if we'd encase the whole thing in a transparent, plastic cover. Then it'll be impervious to water and oil and we can clutch it in our clever little hand as we walk around looking for trouble before it happens and not have to worry about it wearing out or getting dirty.

TIRES ought to go down on our list with a capital "T." Don't pat or caress the precious chunks of rubber. Give them a hefty kick and make sure they've got some air in them. Look for pieces of wood or metal or foreign material of any kind that may have penetrated the tire. Where I picked it up I don't know. But I found a length of one-quarter inch copper tubing sticking in one of my tires one morning. I might have got off the ground all right, but the landing could have been nasty.

WHEELS are subject to deterioration and breakage. And, Brother, what a pounding they take from some of our landings. Look for cracks or warpage or any sign that something might give on one of those not-so-smooth touch-downs. Don't overlook loose hub caps. Friend of mine lost a hub cap on take-off. Before he knew what was happening, the bouncing hunk of metal shot up and smashed his propeller. Four-bits worth of disk caused a big repair bill to say nothing of a few uncomfortable moments spent by an unhappy pilot.

HYDRAULIC AND BRAKE LINES usually leave ample tell-tale evidence when something is awry. Spots of fluid on the tire or the ground mean trouble. Those unplanned endurance flights over the control tower where some poor Joe is trying to sweat down a reluctant landing gear don't always happen all at once. Frequently, brake or gear failures spell themselves out for days in advance. Look over all visible lines for leaks and loose fittings.

STRUTS probably do more for sensitive flight and engine instruments than for a pilot's derriere. Make certain that the struts are properly inflated and that there are no leaks. Besides the danger inherent in a low strut, this condition can be costly. A severe landing jar, which may be transmitted throughout the whole aircraft because of faulty struts, can cause expensive damage to any number of instruments and fittings.

PROPELLERS require their share of preflight attention. Most of us overlook the fact that a propeller is a delicate, finely-balanced device. And a small nick or cut or scratch on a fast-spinning prop can set up some tremendous forces. In fact, these forces can become so great that the vibrations which result may add up to some costly engine damage in just a short while. I didn't believe this either until a mechanic friend of mine pointed out such damage on a dismantled motor. Believe me, I reached for my pocketbook. And fast.

See that the propeller hub and attaching parts are tight and defect-free. Again, excessive oil drip is a warning sign if an hydraulic, adjustable prop is part of the equipment.

ENGINE check should be thoroughly and consistently effected. I know that this one can become routine and superficial if we're not careful. "Cylinders all in one piece, exhaust pipes in place, etc., etc.," we mutter to ourselves. But look out, brother. This sort of thing can be dynamite. Take the close squeak I had one day.

I had become careless about going over the engine. I was looking but not seeing. And I failed to spot a wobbly oil connection. Afterwards, I realized that I should have seen it if I'd had the top of my head on.

This happened to be a twin job. And just as I was about ready to pull it off, I looked at my starboard engine and saw a wicked stream of oil pouring out. I chopped and jammed and cut and managed to bring it to a stop in time. I still sweat when I think what might have happened if I'd become airborne. This should never have happened if I'd really been checking my engines before flight.

Run an eye over the cooling fins. Excessive dirt can heat up an engine tremendously. And have a look peeled for rags or wrenches or mechanics' hats or most any other thing which might be jammed in the engine someplace. This list is by no means a figment of my fevered imagination. All this and half the contents of a barnstormer's footlocker besides have been or have not been removed from the various folds and crevices of an aircraft engine. Is it any wonder that the CAA screams its head off about fire prevention?

★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★

The first individual to do an aviation column was a woman. She was Mrs. Elizabeth Hiatt Gregory. As a news reporter and analyst, she began her column in 1909 by following the careers of the Wright Brothers, Glenn Curtiss and other aviation personages. She was on hand to see the first shot fired from a moving plane. Now, of all things, a lookout tower has been delivered by parachute! It took place in the Selway Wilderness area of Montana. The U. S. Forest Service dropped more than 130 timbers from a twin-engine Douglas DC-3 which made three trips to drop the 9,200 pounds of lumber which were used in the construction of the tower.

★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★

FUEL AND OIL. Caps have the beatin'est way of coming loose at the awfulest moments. If you have ever sweated out a situation where gasoline was siphoning out of a B-24's wing tanks into a spark-filled bomb-bay, you know what I mean. No matter what type plane you're flying, make sure those caps are *tight*. Here again, watch out for leaks. And know your quantity on board. Get out a dipstick if you don't trust your gasoline gauge. Whether you're going to fly x-c for fun or the record, 5,000 feet up is a bad place to realize that the gauge needs calibrating.

WHEEL CHOCKS come in quite handy for engine run-up after starting. Then there is always the possibility that we didn't set the brakes, shame our little souls. Results of this can be ludicrous or tragic, depending upon who or what gets in the way of the prop when the engine takes hold and we start highballing straight ahead. And whatever the result, it's apt to cost dough.

LEADING EDGES give out on occasion. This is what happened to Melvin. Contour molding can and does fail on occasion, with a resultant loss of lift. Usually, any tendency of this kind may be anticipated by slapping the leading edge firmly but carefully. Any weakness will show up.

COWLINGS mean a lot in the way of airspeed. But they can wreck an airplane if they come loose in flight. Even a half-loose cowling is a thing to be feared. Mechanics are not immune to interruptions during their work. And a half-fastened cowling happens just often enough to make this check a requisite for every pre-flight inspection. Look over those fastenings carefully.

PITOT TUBE cover keeps the water and dirt where they belong. But make certain that you remove the cover before taking off. It's an uncomfortable feeling to make a pass at a strange airport with no idea what your airspeed is. Doubly so if you're landing at night.

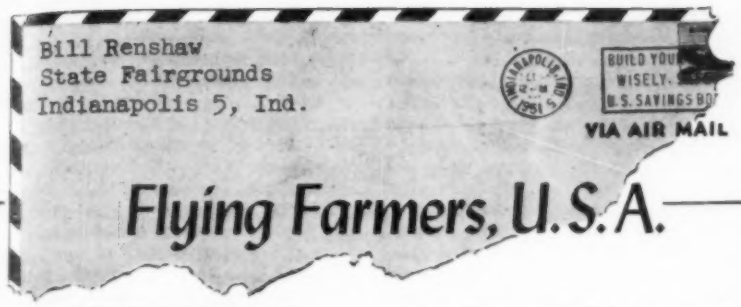
CONTROL SURFACES AND HINGES have a way of deteriorating. Most common condition is a "bullseye"—one of those nasty little situations where someone has poked a hole in the fabric. Or a flying stone may do the same thing. These damaged spots can and do tear loose during flight resulting in lack of adequate control. Through wear and oxidation, hinges weaken. See that these important members are in good order.

TAILWHEEL or nosewheel requires the same inspection as the main wheels. Watch for the tire situation and the inflation of the strut.

INSPECTION PLATES are meant to be unfastened for looking at the insides. But make certain they are all secure before flying. Like the engine check, don't allow this item to be handled in a superficial manner. Poke and pick at the plates if necessary. But satisfy your mind that they are tight.

EXTERNAL LOCKS should never give us any trouble. But they do. Write this in red if you must. But for the love of heaven, don't forget to free those controls. Someone at someplace in the world goes flying off the ground almost every day with his controls gripped in the clutch of one of those big, red locks. That somebody need never be you if you'll make this important check before you try to get off the ground.

There it is. As I said, I'm inclined to think that the gods will be much more kindly toward us if we do our part to insure safe and economical flight. Write each item on your card—TIRES all the way through EXTERNAL CONTROL LOCKS—with as many clues as you need to remind you what to look for. You'll have an easily-handled, accurate guide for previewing the condition of your airplane before every flight. END



Flying Farmers, U.S.A.

ALL-WEATHER PLANE NEEDED

There is growing sentiment among flying farmers for a "roadable airplane." Most recruits to the combination land-air machine come from flying farmers who have been seasoned by bad weather flying. Farmers, perhaps more than any other single group, detest "sitting out weather," and are therefore more likely to fly in marginal weather.

Success in farming has always hinged to a great degree on the elements. Farm machinery, especially in the harvesting category, has in recent years gone a long way toward helping eliminate the weather hazard. So it is that aviation-minded farmers look to the industry to do something about weather, instead of just talking about it.

Two types of airplanes have been suggested as all-weather planes. One would be fairly conventional in construction, but would be capable of extremely slow flight. It could be landed safely almost anywhere. The other would be roadable. Upon encountering bad weather, it would take to the highway. Proponents of the roadable plane argue that it would also eliminate the airport-to-town transportation problem.

Sam Freeman, President of New Jersey FF's, puts the case very well for the latter group. Commenting on our column in February FLYING, he says:

"I agree with those who say we don't have the right vehicle. We need a roadable, slow flying, yet fairly fast cruising airplane, capable of operating out of small unprepared fields."

"We are nowhere," he concludes, "near getting it right now."

It is well that flying farmers are thinking seriously along this line. The greatest reservoir of inventive genius in the world today is on the farms of U. S. A. It is there that our big farm machinery manufacturers have for years secured their most pregnant ideas. In our farm shops, farmers have for generations fashioned tools out of sheer necessity. Some of these machines, crude though they were, started farm machinery manufacturers on a path that has made American Agriculture the most mechanized in the world. Our aircraft industry might profit by the lesson the farm machinery people have learned so well.

* * *

THE OHIO PROJECT

The practical inventive ability of farmers gives the Ohio project a far better than average chance of producing something very good in an applicator airplane.

The Ohio project, as originally outlined, calls for the creation of what might be termed "a cross breed."

Animal genealogists know that cross breeds are often possessed of unusual vigor. This may well be true of the "fusing" of designs in the creation of this applicator airplane.

Sire of this sprayer and duster is the AG-1, developed at College Station, Texas, under the direction of Fred Weick, noted lightplane engineer. Dam is the trustworthy J-3 *Cub*.

Work is being done at the Grimes (Flying Farmer) Airport, Urbana, Ohio. The cross breed, barring unforeseen obstacles, will be flying before the applicator season gets underway.

* * *

FF'S CAN BE THRIFTY

There is definitely a bright side to private flying. Not all private pilots are selling their airplanes, and not all airports are going back to soybeans and corn. Agricultural flying is going forward on almost all fronts. Alabama Flying Farmers, who will play host to the National Convention, August 28, 29 and 30th, have set their attendance goal at 2,000 as a very minimum. Realizing that past conventions have been too expensive for the average flying farmer and his family, the Alabama folks, in addition to developing an unusual program, are determined to keep expenses down for their guests.

Byron A. Grant of Livingston, Alabama, puts it this way: "We think living costs should be held down at our conventions, thus making it possible for more FF's to attend."

Grant concludes, "We should never have less than 2,000 in attendance at one of our National Conventions."

Few flying farmers have expense accounts, consequently are "expense conscious." The Alabama folks are on the right track.

* * *

THE ANSWER: SALESMANSHIP

"No concerted effort to sell airplanes to the public either by the manufacturer or the dealer," is the way O. G. Edwards, RFD #3, Dexter, Mo., answered our question as to what is responsible for the decline in private flying.

Edwards, who started selling automobiles in 1910, drew an interesting parallel, by pointing out that the woods were full of people who had no idea that they wanted an automobile until an aggressive salesman took over. "The desire," he asserts, "had to be created."

Edwards concludes. "There are thousands of potential airplane buyers, but," he adds, "the desire to own an airplane must be awakened by demonstrations and salesmanship."

This columnist feels that Edwards has scored close to a bull's eye. We personally know of dozens of airplanes that have been sold by flying farmers who kept taking the neighbor down the road on their business flights. In the selling game, nothing succeeds like salesmanship.

At every airport in America, you'll see young men standing outside the fences, watching the planes come and go; watching the busy hum of the activity of servicing and repair. Are you one who only watches when you could be an important part of these activities?

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UNIVERSITY OF AVIATION

Strat Recon

(*Continued from page 17*)

with droppable wing tanks. Those used for photo work have nine cameras, fully controlled from the cockpit and each adapted to a special job. They point down and to the sides, with their pictures stretching from horizon to horizon, and permit several views to be taken simultaneously. Each camera is quickly ready for re-use.

Let us say now that an RB-50 has just returned from making a reconnaissance mission over a small city. Taken from about 30,000 feet, the pictures cover an area averaging 30 square miles. As in standard recon practices, extreme care is used during the entire processing of the pictures. After the photographs are developed, they are washed and delivered to a huge dryer, another step in their preparation for plotting.

This time-consuming and precise job then includes the matching of topographical details, trimming of the pictures and their mounting by overlapping. The finished photograph, which may consist of many smaller pictures, is called a mosaic. At this point standard procedure continues with examination of the photographs under an instrument called a stereoscope, and it is here that the interpreters of the 55th take over, aided by one of the strangest libraries in existence.

This is composed of a number of books produced by the Air Force, which contain photographs, charts, graphs, and other data on practically every class of building or military installation to be found on the face of the earth. In this library will be found front, rear, top and side view pictures of warehouses, depots, gas and oil tanks, airport buildings, hangars and runways, and so on.

A section of the 55th's mosaic is observed through the stereoscope in multi-dimensions. For instance a long building, under the instrument's magnification, will be seen highlighted in its length, width, height and depth. Other buildings, shown on the mosaic in their tiny size, are as easily adaptable to further study under the stereoscope, and of course specific areas can be blown up photographically.

Factors like the multi-dimensional aspects, the time of day and year and the position of the sun, the latter producing influencing shadows, all help in reaching the ultimate findings.

Hypothetically, the long building just mentioned is an interesting structure under the stereoscope. For one thing, it has a cantilever roof. On consulting the library, the interpreters find this indicates a large space underneath, one that does not need center supports. With this in mind, the building is presumably constructed of steel and concrete, the latter evidenced by the sun's shadows registering on light gray walls.

An open approach to the building on all sides indicates to the interpreters an area for moving heavy traffic, both automotive and foot, as shown by the depth and width of various ruttings, some obviously made by very large vehicles.

Structural analysis also shows loading platforms. There now is little question on the part of the interpreters that this structure is a big armory. The conclusion is that the heavy ruttings were made by prime-movers hauling guns. The light ruttings, bare scrapings on the photograph but showing evidence of long duration, represent the traffic of foot soldiers.

Again referring to the library, the interpreters could derive from study of representative armory drawings and pictures, approximately how many guns, tanks, prime-movers and other military vehicles would be kept in such an armory in wartime, and by further deduction, how many men would be required to maintain this paraphernalia and otherwise be on duty, as well as what stocks of ammunition might be inside at a given time.

This picture was produced in pioneer reconnaissance, the first step of the whole operation. Now the findings will go to bomb experts who will determine what type and quantity of bombs will be used in the strike at the armory, which is the second step in strategic reconnaissance. The bomb experts have an easy job in this case. With the armory shown to be made of steel and concrete, "block-busters" are called for rather than incendiaries, and so are specified fuze settings to blow up machinery and vehicles after initial impact. Another photo flight over this building after it is bombed would constitute the third and last phase of strategic reconnaissance—the damage assessment.

In another example, let us take a different sort of structure as seen through the eyes of the interpreters of the 55th Technical Reconnaissance Squadron. Here the picture shows big masses of piping, large storage tanks, the presence of tank cars and tankers at piers. This is an easy one, obviously a refinery, even from 30,000 feet and through haze.

But if there was any doubt about it there would be a reshot in color. Then, should the picture disclose an aura of orange around the tops of the pipes, or even a small indication of it, this would indicate to the interpreters that oil or alcohol was being burned, as in a refinery.

The use of color film in strat recon, which now is implementing black and white rather than succeeding it, has opened up new fields in interpretation. For instance, the analyzers can get some answers by studying waste products from industrial buildings. Red smudge would designate the presence of iron, probably indicating a foundry; and if smoke emanates from a chimney, the type of fuel being burned, and what it might imply by further deduction, often can be determined.

In addition to the color of waste, its composition and bulk as noted when it is piled on the ground, can give valuable clues as to a factory's production and the

"Things weren't bad enough—now we got pedestrians!"

number of persons it employs. This is determined by consultation with the library, which would show an identical building or a similar one, with accompanying vital statistics telling how much and what type of production would be necessary to create a pile of waste of the color and size shown on the reconnaissance photograph. The production figures also would give an average picture of how much manpower was needed.

Assortments of lumber, brick and machinery around a building, as seen either in color or black and white, also would indicate to the interpreters that repairs from a previous bombing were underway, and probably how far these repairs have proceeded. Why waste a bomb if this hasn't progressed far enough? Such deduction in a case like this may seem elementary, but it is not necessarily as easy as it sounds.

The use of color film at the moment has some limitations. Haze is a barrier still to be partially overcome. Various filters have to be employed. One former barrier, slower processing, practically has been solved through use of field processing equipment. And it is not necessary for true color rendition, just as long as there is enough for interpretation.

But it seems to be worth it, for the 55th's experts are finding new uses for color film every day, over those of black and white. Camouflage is a good example. A verdant area, as photographed from several thousand feet, in most cases will not show any abrupt change in shade or color. But even a well-merged camouflaged area will, to the sharp well-trained eyes of the interpreter. The composition of buildings also will show sharper in color. Underwater obstructions will be noted more easily, and so will water depth, as indicated in the changes in the shades of blue and green. New construction, evidenced by newly-upturned dirt, which would be of a different shade of color than the unexcavated area, could be observed quickly in color photographs.

Color also has proven to be useful in taking high altitude pictures of enemy runways. The silver skin of a military aircraft always has had a tendency to merge somewhat with the concrete gray of a runway. Color brings the silver out, in distinct contrast, even from as high as 20,000 feet, pictures taken at Ramey show.

All these phases of interpretation are well coordinated with other aspects of strat recon. For instance, evaluation as taught at Ramey and certain other bases, has been so excellent in radarscope photography, that 100-per cent accuracy often has been achieved in long-range, all-weather, day-and-night bombing in Korea.

This flexibility also applies to use of photo-flash bombs in aerial photography, particularly suitable in ascertaining bomb damage and the presence of aircraft on the ground at night. There is little handicap for the interpreter here, because new type bomb fuzes cause the bomb to burst in such a way as not to interfere with the photography. These bombs average 500,000,000 to 600,000,000 candlepower each, but there are those of even greater, but still classified capacity, undergoing tests at Ramey and Eglin Air Force Base, Fla.

Still another aid to the interpreter in achieving maximum exactitude in pinpoint bombing, and one which has had somewhat astonishing sideline results, is a comparatively new development called Shoran.

It has become a valuable adjunct in the use of guided missiles and other new weapons of this day, but at the same time, by providing exact computations of bomb targets electronically, is making the work of the interpreter that much easier. For what good is expert strategic reconnaissance analysis when the target isn't where it is supposed to be in the first place?

That is not as strange as it seems, because Shoran, as used by the 338th Strategic Reconnaissance Squadron in remapping the Caribbean area, already has proved that the Island of Cuba is a good 1,500 feet Southwest of where it is shown on standard maps.

And other errors have been found on standard maps since this squadron started its survey last March, using RB-50's equipped for Shoran. These errors show that Grand Bahama Island is five miles off from where it is supposed to be, and Eleuthera Island, directly east of Nassau, isn't even of the shape it is shown as having on standard maps. As its survey progresses the 338th can expect other mistakes to crop up, for such is the unerring accuracy of Shoran, or short-range navigation.

In Shoran controlled aerial photography, the cameras automatically take pictures every two, five or 10 seconds. The system utilizes electronic ground stations and a special receiver in the RB-50 which also is usable as a camera platform.

The ground stations are accurately positioned in relation to the area that it is desired to photograph. The principle involved in this operation is a measurement of the time it takes electronic signals, simultaneously transmitted from two ground stations, to arrive at the RB-50's receiver. The time differential of arrival of these signals at the airborne receiver, can be measured and recorded as the geographical position of the RB-50, at any particular instant. In this manner, spaced photo flight lines over an area of interest can be very accurately flown, because the plane has a constant true position.

It might be well in closing to point out the hazards of the "man behind the bomb." Even as late as World War II strategic reconnaissance was accomplished by a lone pilot-photographer, in a fighter plane, hardly a worthy target for flak when the enemy granted him that attention.

Now, however, the enemy no longer can afford to ignore the lone "prowl" plane. He knows that a single aircraft equipped with an atomic bomb has the destructive potential of a thousand World War II bombers. The enemy cannot tell whether the plane overhead is carrying the big bomb or more prosaic photo film.

Every strat-recon pilot knows he is a "must" target for the enemy. END

Captain P. V. H. Weems, U. S. Navy, Retired, founder of Weems System of Navigation, author, internationally known consultant on air and sea navigation.

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WING TALK

Gen. Carl A. Spaatz, chairman of National Executive Board, is presented with lifetime membership in National Aeronautic Assn. by Joseph Geuting (left) and Donald T. Webster.

Big Camp Year Coming

PLANS FOR THE BIGGEST CAP cadet encampment season in many years took shape recently at the Pentagon in Washington with a presentation by Civil Air Patrol National Headquarters to representatives of major Air commands in the Zone of Interior.

Spearheading the presentation for CAP were Col. Mills S. Savage, Chief of Staff; Col. Robert H. Wheat, USAF Liaison officer to CAP; Lieut. Col. William H. Trachsel, DC/S Operations and Training; and Capt. Walter Zaharevitz, Asst. Dir. Tng., CAP Hq. Their plan called for 45 Air Force sites to accommodate approximately 8,300 cadets—both boys and girls—and 725 supervising CAP seniors—both men and women.

The overall criteria for encampments will not change materially over last year, when 33 encampments took 4,114 cadets and 420 CAP supervisors. There will be an attempt this year, however, to acquire the services of Air Force Reservists on short tours as encampment supervisors or instructors.

Chairman of the Pentagon conference was Col. John T. Shields, of the Directorate of Operations, USAF. Both he and Colonel Wheat stressed the feeling of Air Force that the encampment schedule is important to all CAP and the AF and that every effort should be made by each command to implement the presented plans.

As in the past, camps would be of two week's duration. Transportation to sites from homes would be made, insofar as possible, via USAF airlift. The 1952 encampments would be held in all geographical areas of the U. S., and the Territories.

JC's Pledge Support

AGAIN FOR 1952, THE JUNIOR Chamber of Commerce of the U. S. has pledged support to CAP. Their 1952 Aviation Manual, soon to hit the mails, will carry an orientation into CAP and the aims of JC in promoting the organization in JC youth work.

ARS Likes CAP

HIGH PRAISE FROM AIR RESCUE SERVICE has been given Civil Air Patrol's search and rescue aid during 1951. Col. Richard T. Kight, commander, wrote in the ARS newsletter that it was mainly due to the existence of CAP that ARS has been able to concentrate such a large number of aircraft and crews in the Far East.

Reporting on the year to the National Executive Board, a National Headquarters representative said that 78 actual search missions were flown during '51 for a total of 5,800 hours. Authorized practice search for the year totaled nearly 6,000 hours.

Aviation Education Workshop

THE UNIVERSITY OF COLORADO and Civil Air Patrol headquarters jointly will sponsor the First Annual National Aviation Education Workshop at the U. of C., July 23 to Aug. 26, it was announced by Dr. Robert L. Stearns, the University president, and Major Gen. Lucas V. Beau, CAP commander.

Dr. Mervin K. Strickler, CAP's aviation educationist, will direct the workshop, which takes place during the last half of the summer session. Dr. Strickler indicated that at least 100 teachers are expected to attend on local CAP scholarships from all 52 wings. A room, board and tuition scholarship for the Colorado-CAP workshop comes to only $150.

In addition to class and seminar sessions, Dr. Strickler said that the many facilities of the university would be utilized to put across this high level orientation into aviation education. Ordinary and high speed wind tunnel tests (some in excess of Mach 1) will be observed by the teacher-students. Trips to commercial and military air installations, a possible glider demonstration, the vacation atmosphere of Boulder, Colorado, and the vigorous administration afforded by CAP and the university are expected to add much to this aviation education workshop.

Interested teachers should direct inquiries to Dr. Stanley B. Brown, University of Colorado, who will be coordinator for the joint project.

Reg Authorizes Cadet Units

ADDED SPACES FOR OFFICERS on all CAP staffs and "cadet squadrons" where no senior organization exists are authorized in CAP Reg 20-1, recently distributed to the units. The move makes possible a wider distribution of the workload at wing, group, squadron and flight levels, where there has been experienced much added administration.

Seen as one of the most important trends in the organization, the regulation sets up procedures for establishing the first cadet squadrons, to be handled solely by the cadets with the aid of only three supervising seniors. Thus, a large school in a rural community, for instance, may have the benefits of a cadet organization and the aviation education afforded in the program.

Pentagon Meets With Execs

AN UNUSUAL SHOW OF STRONG USAF support to Civil Air Patrol came during the last meeting of the National Executive Board, when top officials of the AF held a Pentagon luncheon for the Board members. Attending were Air Force Secretary Finletter, former Assistant Secretary Zuckert, Chief of Staff Gen. Hoyt S. Vandenberg, Deputy Chief of Staff Gen. Nathan F. Twining, Gen. Carl A. Spaatz, USAF (Ret.), chairman of the Board; Col. D. Harold Byrd, CAP, vice-chairman; and the seven members.

Secretary Finletter previously had met with the National Executive Board at Colorado Springs and Washington, D. C.

Col. Sid Perryman, commander of group 2 at Olney, Tex., leads a group of cadets on tour of flight line at Sheppard Air Force Base. The entire tour took two hours.

I Learned About . . .

(Continued from page 38)

slightly, brought the nose up a few degrees. At an indicated 75 m.p.h. fed in right rudder, brought the stick back and flipped over in a spin to the right. One—two—three turns, sharp opposite rudder, next rudder to neutral. Stick relaxed in one coordinated motion, back pressure on the stick bringing the nose to the horizon, AH, right on the money, what could be sweeter.

A series of chandelle turns soon brought me back to 5,000 feet, where I decided to try a couple of snap rolls.

At 105 m.p.h. Indicated, I brought the nose about 15° above the horizon, fed in full right rudder, snapped the stick back and executed a perfect snap to the right coming out of it with the nose smack on the horizon. Feeling quite pleased with myself, I repeated the maneuver to the left.

As the plane snapped over a sudden banging behind my head shattered my pleased feeling with a rude start. I jerked my head around in time to see the baggage compartment cover glance off the horizontal stabilizer and spin crazily off into space. During the moment that my mind was taken from the controls the Stearman stalled out and I found myself obliged to split ess out.

In trying to regain a normal flight attitude, I found that the rudder didn't respond and the elevators were very sloppy. For a second time, I jerked my head around and my heart leaped to my throat when I saw that the engine cover had been sucked from the baggage compartment and was draped around the horizontal stabilizer and beating frantically in the slipstream against the fabric on the elevators.

My first thought was to bail out—but fast. But as reason began to return to my mind, I noted that I had about 4,500 feet of altitude left. My decision was to stay with the plane until I was down to 1,500 feet and if I couldn't shake the engine cover by then, I would hit the silk, a prospect of which I took a very dim view.

By gingerly experimenting with the controls, I found that I could maintain a fairly steady and level flight at about 80 m.p.h., still keeping my altitude. After much internal strife with myself I decided to attempt to shake the cover by maneuvering the Stearman with as much control as I had left.

I put the plane into a shallow dive. The cover was beating on the elevator fabric until I thought surely the fabric would be ripped to shreds. At 110 m.p.h. I popped the stick back and chopped the throttle in one motion. The elevators took a sluggish hold as I held the stick in the pit of my stomach and the nose came up and over.

At about 45° behind vertical, the ship stalled out and spun off to the left. With one hand on my safety belt release, I neutralized the rudder and popped the stick slightly forward in a normal spin recovery. I half expected nothing to happen, but I heaved a great sigh of relief when I felt the seat of my pants being pressed into the seat as the Stearman recovered from the spin.

A quick look back at the empennage assured me the ship had shed her gremlin. Other than a hollow booming sound the slipstream made in the open baggage compartment, the Stearman seemed in good enough shape to get me back to the air base.

In my nervousness, I landed the plane like a ham-handed novice and managed to taxi it to the ramp without further mishap.

I sat there in the cockpit for a couple of long minutes remembering all that had ever been told to me about preflight inspections. When I climbed out of the ship, I was certain that I would never again fly another airplane without giving it a thorough inspection. I can readily say that in the many hours I have flown since, a thorough inspection has saved me a recurrence of that experience, with possibly more disastrous results. END

Spiral Dives

(Continued from page 21)

attention to the necessity of eliminating the spiral dive tendency before "Dr. Smith" can fly safely in all kinds of weather, unless he is an experienced instrument pilot. They also requested that appropriate Federal agencies be approached to initiate a project "to determine an effective method of eliminating spiral instability in existing and future aircraft."

Unfortunately, when the association met in Tucson in late October, their president, Crocker Snow, had to report that "nothing much was done about the problem of spiral instability because most of our time was taken up with civil defense and other matters."

Nevertheless, their interest in the problem adds impetus to the growing demand for an answer to the spiral instability problem.

Hugh De Haven, director of the Crash Injury Research department at Cornell, feels that the problem is not alone one of engineering, but of educating the pilots as well.

"All groups concerned with safety in private flying recognize the extreme hazards implied by 'spiral instability,'" he says.

But he hastens to add that "I, personally, am not sure that building spiral stability into an aircraft will alone significantly alter the rate of vicious accidents caused by loss of control under instrument conditions."

De Haven feels that "only part of the problem lies in building a spirally stable plane; the other part lies in educating the pilot to use it, believe in it and let it alone when his senses tell him—very con-

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vincingly—that the plane is in a steepening spiral." He warns, however, that "if we give part-time pilots enough instrument training to offset 'the leans,' it is likely that more of them will tackle bad weather and eventually get trapped by conditions (i.e., traffic and turbulence) beyond their capacity to handle."

We asked another expert to give us his views on the problem. A. Howard Hasbrook, a former Air Force instrument flight instructor now with the Flight & Accident Evaluation Section of De Haven's department, recalls seeing experienced pilots "blow up" under pressure while making a letdown in a "slippery" airplane in turbulent air.

"Since it takes a fairly well experienced pilot to use even an automatic pilot," says Hasbrook, "it would seem that what the average 'Joe' needs is a simple and inexpensive device which can be installed in an airplane—or originally built into it—which will prevent the airplane from attaining and holding more than 15° of bank in a hands off condition.

"Preferably, such a device would then cause the airplane to recover from the bank in a slow and controlled manner and gradually roll to an opposite bank of not more than 15 degrees," he continues.

"It would then be only necessary for the pilot—if he wanted to let down in bad weather—to trim the airplane to a safe minimum approach speed, cut his power back to a predetermined and recommended point and then take his hands and feet off the controls. The plane would then descend at a controlled speed, turning gradually to one side, then to the other, but never getting into an uncontrolled high speed spiral dive."

Hasbrook feels that a "simple and inexpensive way of producing the desired characteristics in both slow and fast personal aircraft" is possible, if enough attention is brought to bear upon the need for it.

At the University of Illinois in Urbana, Leslie A. Bryan, director of the Institute of Aviation, educates student pilots to the dangers of the spiral dive by placing them under the hood "to demonstrate that he cannot fly on instruments without training."

It takes the average student 20 seconds to find out about spiral instability, he says.

One man who is confident there is an answer to the problem is Fred E. Weick, director of the Personal Aircraft Research Center of Texas A & M, which for some time has been engaged in a development project on an airplane "that would always continue to fly straight if it were not deliberately turned." Weick, too, admits that his project has a relatively low priority "and we have not yet gotten at it in earnest." However, he points out that "most present personal airplanes are free from spiral instability at cruising speeds and higher."

Weick warns that "the balance is a very delicate one, and the tendency to fly straight is a very feeble one. The usual control friction is sufficient to mask the stability and make it substantially useless."

Another group has been pursuing the spiral instability problem in earnest—the National Advisory Committee for Aeronautics. In December, 1949, Marion O. McKinney, Jr., of the NACA's Langley Aeronautical Laboratory, reported that "an analysis of the uncontrolled motions of personal airplanes has shown that a personal airplane can be made safe as regards spiral tendencies and its uncontrolled motions as regards maintenance of course can be greatly improved without resort to an autopilot.

"The only way to make the uncontrolled motions completely satisfactory as regards to continuous maintenance of course, however, is to use a conventional type of autopilot," he added.

He warned that while most modern private aircraft possess a slight degree of positive stability, "they can easily get into dangerous attitudes and deviate excessively from their original heading in uncontrolled flight because of out-of-trim moments and insufficient spiral stability.

He suggested some means of trimming the aircraft in flight by mechanically centering the controls positively to overcome friction.

This work was followed up by the NACA and in July, 1951, they reported the results of the further investigation which included a series of flight tests run with a Cessna monoplane fitted with control centering devices.

Spiral instability was broken down in two categories—true and apparent. The latter, said the NACA, was due to two reasons:

1. Lack of a means of trimming the airplane in flight, and

2. Friction usually present in most light airplane control systems makes maintaining the same trimmed conditions difficult or even impossible.

Results of flight tests were divided into three categories—the effect of the control centering preloaded springs on the apparent spiral stability of the airplane; the true spiral stability of the airplane at various constant airspeeds with the centering springs engaged, and the effects of changes in airspeed on lateral trim and apparent spiral stability.

Results showed the aircraft was spirally stable over most of the speed range with the controls held in trim position, but was spirally unstable with controls free and the centering springs disengaged. The control centering springs definitely improved the apparent spiral stability by making it possible to trim the airplane laterally. True spiral stability of the airplane with the controls held in the trim position decreased with decreasing airspeed and the airplane appeared to have approximately neutral stability at 90 m.p.h.

When the elevator was used to keep the airspeed constant, the apparent spiral stability was the same in both directions. But when the elevator was free, the airspeed initially tended to increase following release of the controls when the airplane was in a banked attitude.

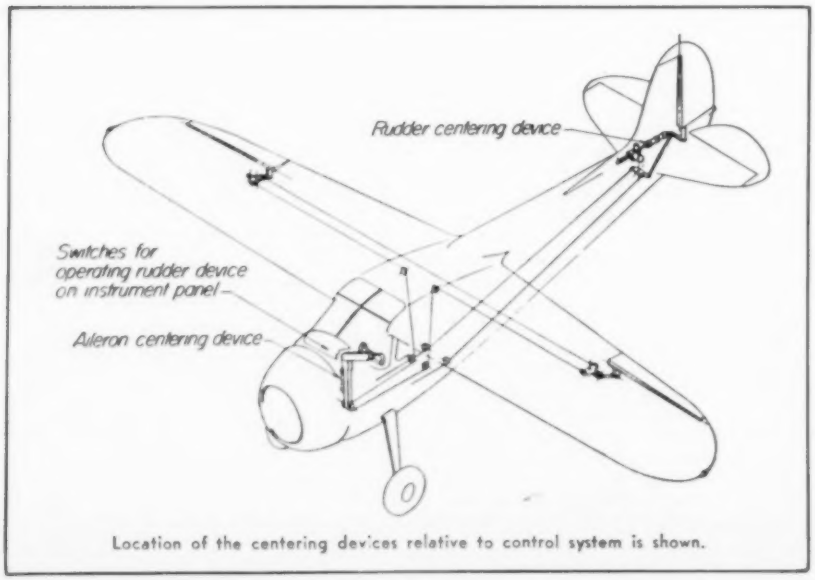
Results further indicated that "the unsatisfactory recovery from large angles of bank with the elevator free indicated that the airplane might not fly satisfactorily 'hands off' in very rough air."

There you have a technical approach to the problem, with carefully observed reactions of an average private airplane to an honest attempt to engineer spiral instability out of it.

If it weren't for the physiological factors that make a pilot go wrong when he loses his natural horizon, it might be that the control-centering device, currently available from a commercial source, would be the answer.

On normal VFR flights, such an accessory would no doubt relieve the pilot of a lot of strain, but it has not yet gained official endorsement as the "answer" to the dangers novices face flying on instruments.

So, until somebody comes up with a good cheap substitute for an autopilot, it would seem advisable to do like the birds do and stay out of clouds if you aren't trained to fly in them. END



Location of the centering devices relative to control system is shown.

Minute Men

(Continued from page 31)

All three guns are directed automatically by fire-control systems: the 120 and 90 using the T-33 system, and the Skysweeper the T-69 system. We shall see later what such automatic direction entails; but some idea of the complexity of these systems can be gained by noting that the pre-Korea price of the Skysweeper fire-control system was $369,382, while the gun itself cost $338,518. It is of interest that the larger 90 mm. gun itself cost $140,000. No costs are available on the T-33 system, but it is said to be "on a par with the Skysweeper system for accuracy and automatic capabilities."

In the inside of the defense ring are found the three types known collectively as "automatic weapons." The popular 40 mm. (Bofors) is usually set up on a dual mount, and this twin-unit is called the M-19. Each gun shoots a four and one half pound shell up to about 10,000 feet. It is hand-loaded by clips of ammo and can shoot up to 120 rounds per minute. When used with an M-5A2 director the 40 mm. gun is manned by a crew of 12. But only seven men operate the guns when the on-gun speed-ring sight is used.

The "quad 50s," or quadruple caliber .50 machine guns, are highly versatile weapons for extreme inner and outer defenses. The quads can be set up in an M-45 power turret on the ground or mounted in an M-16 half track when mobility is desired. Five men normally operate the quad 50s. Each gun shoots 500-600 rounds per minute to maximum effective ranges of 800-1,000 yards.

Somewhat similar in purpose and function is the M-15A1 which mounts a 37 mm. cannon and two caliber .50 machine guns on a manually-operated turret. The 37 shoots 120 rounds per minute, firing the 1.3-pound shell over a maximum effective range of 3,500 yards. The twin machine guns have about the same cyclic rate and range of those in a quad 50 installation. Computing sights are used on both the quad 50 and M-15A1 weapons.

Generally speaking, these guns are sited around the objective to be protected in the order mentioned, with the heavier caliber guns around the perimeter. The "R & A Boys" base this defense-in-depth scheme on the manner in which bombers are capable of launching an attack. Most FLYING readers know how a bomb travels forward for a considerable distance after it is released from the plane: the higher the altitude and speed of the bomber, the greater the travel, or "range." Thus, the big 120s and 90s are sited on the perimeter so as to hit high-flying bombers outside their bomb-release line. The Skysweepers and smaller automatic weapons are sited inward because enemy bombers must approach from lower altitudes in order to hit the defended objective. If the bombers don't come in lower, their bombs will travel way over. Automatic weapons are sometimes sited on the extreme perimeter to protect the big AA batteries against enemy aircraft which might attempt to run interference for high bombers by strafing the AA defenses.

We could never have available at one time enough AA guns to offer total defense of the many vital areas and cities of the U.S. The "R & A Boys" had, therefore, to devise a system which would offer the maximum protection with a practical number of AA weapons. This system, or doctrine, includes two operational schemes known as Attrition Rate and Optimum Gun Ring. The former is the percentage of attacking aircraft which any given AA defense can kill. For instance, the defense of New York or Washington would demand a high Attrition Rate against attacking bombers because of their importance and vulnerability. Oshkosh or Tampa would require a low Attrition Rate. You, as the AA commander, are faced with the problem of how high a percentage of hostiles your defense is required to kill. (Other commanders of both AA and air units are faced with the same problem locally; and the nation's overall defense Attrition Rate becomes the total result of the joint effort of all antiair agencies—ack-ack and interceptors.) By consulting a sort of slide rule called an Attrition Rate Nomogram, you can determine how many AA batteries (four heavy guns each) you'll need to achieve the proper Attrition Rate for your objective.

Now *where* you put these guns is another story which involves the second scheme of the system, Optimum Gun Ring. To permit each AA battery maximum effectiveness, the OGR scheme is used because the distance of this gun ring from the objective you are defending governs the total effectiveness of the defense. The object is to provide a balanced defense with the smallest number of guns possible for continuity of defense. If you go to one extreme and site your heavy AA batteries too far out from the continuity—it would take more guns to ring the objective than are available. If, on the other hand you site a much smaller number of guns closer in, you again lose depth and continuity of defenses. Moreover, your guns will not be within range of the bombers before they arrive over their bomb release lines. It is of little avail to shoot down the bombers after they have dropped their bombs. Since these close-in and wide perimeter extremes do not make for efficient defenses, the "R & A Boys" figured out a practical ring somewhere between the extremes —a compromise or "optimum" gun ring.

You now determine a whole series of these OGRs on the basis of all the expected attack conditions—high bombers, low level attacks, etc. The circumference of each OGR depends also on the area of the objective and the reach of the AA guns you have available. By consulting an Optimum Gun Ring Table, you can arrive quickly at the best ring or series of rings for your particular problem. These are plotted on a map overlay, and the batteries are spaced evenly around the ring every 30°. A flexibility feature called the "90-per cent zone" permits adjustment of gun sites to compensate for terrain features such as bodies of water or mountains which might happen to co-

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incide with the mathematically-correct OGR.

With the correct number of guns and in the correct locations around the objective, you are still not ready to commence firing at the first "bogey" that comes along. Among other kinds of confusion, this spontaneous AA firing would result in the "over-killing" of one hostile while other planes might sneak through undetected, and, if detected, unengaged by the ack-ack. In order that AA commanders may keep careful track of who's shooting at whom, they use a new tactical scheme involving an AAOC (Antiaircraft Operations Center).

The AAOC resembles closely—and is, in fact, patterned after—the air force Ground Control Intercept stations. Radar warning information from the GCI stations is collected at the AAOC. And a new wrinkle involves the use of an "acquisition radar" which belongs to the AA operations center itself. Plots from the two sets of radars are evaluated at the AAOC, and information about the courses and altitudes of the unidentified or hostile aircraft is relayed to the particular AA units concerned—usually those being approached by the hostiles. Thus, the operations center becomes a vital link in the overall air warning system—as well as an ack-ack-coordinating agency—by furnishing to the proper AA batteries correctly evaluated target information. Among other things, this permits the AA gunners to engage the enemy under range conditions most favorable to the gunners. Although the detailed organization of an AAOC varies with the particular outfit, the setup shown here may be typical of most.

These operations centers are established at the highest level of command in the particular defense area. While those for metropolitan areas are located in buildings, the AAOCs in the field are set up in 30 x 30 tents. A typical is manned by about 40 enlisted men and four officers who work around the clock in three shifts. A major is usually senior in the role of operations officer. And a liaison officer is detached from the AAOC to sit in at the air force GCI to coordinate raid information.

In the mechanical aspect of the weapons systems concept, however, the experts are seeking to eliminate the human element, for reasons which will become apparent. To understand this better, let's examine the functions of a fire-control system:

1) Its first function is to detect aircraft at the earliest possible moment—thus the term "early warning"—in order to have sufficient time to take defensive measures.

2) Identify the radar targets as friend or foe.

3) Track and report position of the target in space.

4) Predict future position of the target in space.

5) Allow for ballistics of the gun, conditions of ammunition, weather, fuse settings, and other variables such as the "dead time" consumed by the movements of the operating crew. Then deliver these orders to the gun so that its shell and the target arrive at the same point in space at the same time.

The first requirement is fulfilled by early warning radar such as the CPN-2 and/or reports from ground spotters at observation posts. And identification is made by IFF radar equipment that reveals the proper—or improper—code response from the target.

Tracking can be accomplished optically, under favorable conditions, and this is desirable in the event that the enemy attempts electronic counter-measures such as radar jamming. Normally, however, tracking can be accomplished more efficiently by radars such as the SRC-784 and newer secret models. The angular position of the target plane in the sky is defined by azimuth and elevation, or the direction and height above the gun position. As the radar or optical tracker observes the target, the line of sight along which they see it forms the third side of the triangle known as the slant range.

This and other data is "put into" computing devices which, among other things, multiply this slant range and slant speed (rate at which the slant range changes) by the time it will take the shell to reach a point of collision that these devices determine. The solutions or "output" are fed into a director that translates the data into impulses that are passed on through servo mechanisms that aim and fire the gun. But only after compensations have been made for such factors as the gun's ballistics, ammunition, windage, temperature, fuse-settings (when proximity fused shells are not used), and the "dead time" consumed by the movements of gun crew.

The experts want the man out of the picture because the computing and fire sequence has improved in accuracy and speed in direct proportion to the degree that we've succeeded in eliminating the human element. In World War I there were about 21 men involved in the sequence from detection to shooting. One plane was destroyed for each 19,000 rounds of ammo fired!

Between the wars the experts cut the number to 18 men through the use of the stereoscopic range finder and the Sperry-Wilson predictor. At night a device called the "comparator" was used to coordinate the searchlights.

When World War II began, we were using these same devices, but had reduced the number of men to ten. During the war, the advent of radar and the proximity fuse reduced the number to just four, and we used with these the highly-successful M-9 director. Outfits such as the "Antwerp X Command" ran up batting averages ranging from 93-96 per cent against 400 m.p.h. buzz bombs. (Although naval antiaircraft is a subject in itself and is not discussed here for reasons of space, it should be mentioned that several of the units in the Pacific and Mediterranean theaters ran up remarkable AA scores. One ship in the Pacific downed 32 Jap planes in half an hour.) By comparison, we should note, too, that the Antwerp X Command averaged 50 rounds of ammunition per zuzz bomb destroyed; and experts say this number should be halved because 20 to 30 shells were often in the air at the time the robomb was killed.

The Skysweeper and T-33 fire-control systems have need of still fewer men: the former can function without anyone nearby after it has been set for operation.

It appears that such operational systems are progressing logically toward the use of surface-to-air missiles which will seek out their own targets. But we have the gun systems. We don't, yet, have the missiles. Even when the guided missiles become available operationally, the experts envision them as complements of the ack-ack and the interceptor rather than replacements. END

And There I Was...

Around many airports, it is common practice to remove the rear stick of small trainers while hauling passengers, and to replace it later for instructional flights. The stick is safetied in place—at any rate, it should have been one particular day.

After a hurried check and with a beginning student in the front seat, I began my take off run. As the plane reached flying speed, I eased back on the stick and lifted it into the air. You can imagine the shock I experienced when the stick came clear out of its socket. We were out of control!

A few feet off the ground and rushing towards the inevitable obstructions at the field's end, I was able to talk my beginner into taking over and making a wobbly climb to safety.

Many hours and many students have passed, but the memory of this incident is still vivid and abiding. I recall it as the day I learned to check the plane carefully before flying.

John M. Hamilton

AF Buys a Plane

(*Continued from page 34*)

mediately after the competition. This also had the effect of preventing entries from putting in larger engines unless, of course, they already had or expected to get a CAA type-certificate for the installation. Since obviously no existing commercial plane could meet the military characteristics in detail as to military equipment and tactical accessories, the entries had to submit bales of engineering data showing what changes would be needed.

Air Force competitions for the selection of new aircraft—particularly commercial models, are sometimes regarded as mysterious affairs—mysterious to both competitors and to sideline spectators. Both probably feel that the exact reasons for the selection are sometimes mysterious to even those in the Air Force charged with this responsibility. However, in spite of the inevitable chagrin of some of the losers who were perhaps betting from hunger, not reason, the *Beaver* competition was routine and the result inevitable. Here's how it went.

Eight hopefuls showed up at Wright Field for the flight test and technical evaluation but only the Bellanca *Skyrocket* seriously challenged the *Beaver* in performance, load-carrying ability, general arrangement and what the Air Force calls "tactical suitability."

Ryan sent their 260-h.p. *Navion* (not too dissimilar from the Air and Ground Force's L-17). Cessna submitted a standard "195" (similar to their Air Force LC-126). Of all the entries, only the *Beaver*, *Navion* and Cessna are in current production—a factor that undoubtedly washed out all the others since the procurement was for an airplane *now*. The Aero Design and Engineering Company's twin-engine *Aero Commander* was a serious contender (not only in performance but also since it is partly tooled-up), while the four-place *Helioplane*, *Atlas* H-13 (Harlow) and Aqua-Flight's four-place amphibian were also-rans although the *Helioplane* performed well.

The published specification detailing the requirements for this new large class of liaison plane set out the required military functions in rather broad terms. In general, the plane had to perform tractical missions requiring operation from small unprepared landing areas for the purpose of accomplishing liaison functions to include: courier service—20 per cent, messenger service—20 per cent, personnel and light cargo transport—20 per cent, aerial evacuation—15 per cent, and reconnaissance, photographic, troop column control, wire-laying, etc.—25 per cent. The percentages give a rough measure of the importance of each item in the evaluation.

None of the entries in their standard configuration could meet certain basic requirements such as provision for two litters, fittings and structural changes for either ski or twin-float installations, and foldable or easily removable wings. Since time didn't permit even experimental installation of these items, the engineering data was in the form of design proposals.

The minimum performance required in order of importance (at design gross weight including 1,000 pounds payload) is as follows:

Take-off and climb over a 50-foot obstacle and get back in again in 800 feet; a rate-of-climb of at least 1,000 ft. per min.; a maximum endurance of five hours; a stable hovering speed of no more than 50 knots (57.5 m.p.h.); be able to cruise at 75 per cent power no less than 110 knots (126.5 m.p.h); a service ceiling of 15,000 feet, and have a *radius* of action of 220 nautical miles (253 statuate miles)—all done under NME rules. National Military Establishment standard aircraft performance rules used both the Air Force and Navy in quoting performance. All figures are given in knots and nautical miles. These rules allow for fuel used in engine warm-up and initial climb to altitude; and specifies a certain type of flight path for a typical mission.

The *radius of action* figure, therefore, accounts for climb, a high burst of speed over the target while following a specified altitude and speed flight path. All performance requirements were based on standard N.A.C.A. (National Advisory Committee for Aeronautics) atmospheric conditions. The performance of all military planes is now quoted on NME rules to show a plane's actual capabilities and allows a direct comparison between various planes of the same general type.

The manner in which this competition was held differed somewhat from the last liaison competition held at Wright Field which resulted in procurement of Cessna L-19's In this case no formal flight tests were flown to get qualitative performance figures as was done in the case of the L-19 competition. Consequently, no direct comparison can be made between the various entries but it is highly probable that performances bettering the required minimum were less a factor in selecting the winner than were other considerations.

At any event this, as most past evaluations, consisted roughly of four parts: (1) A qualitative flight check by Air Force pilots. (2) A maintenance look-see of design features by ground engineers. (3) A design check of the airplane as submitted plus an evaluation of the changes covered in the engineering proposals. (4) An estimate of the ability of the manufacturer to produce the required quantity in the required time and the unit cost of both the airframe and the GFP required (Government Furnished Property). This then, involved a check by the Flight Test Division, Maintenance Division, Engineering Division and the Procurement Division of the Air Force's Air Materiel Command—only the Supply Division was left out in the direct evaluation.

All entries were flown by each member of a team of Air Materiel Command pilots under the direction of Major Rosenfield, Chief of Training and Cargo Branch, Flight Test Division. Captain Siegler, Lieutenant Eggert and Lieutenant Peterson flew some five hours or more on each entry checking control and stability, certain performance data, and collected data on the plane's tactical suitability as a heavy liaison plane. Maintenance experts then swarmed over the ships, stripping off

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cowls and inspection doors, checking general ease of maintenance and repair. Other engineers from the various Wright Field laboratories looked over the basic airframe, power plant installation, hydraulic and electrical systems, noting features which, from experience, were desirable or undesirable from a service point.

During this time, performance engineers were busy calculating the change in performance due to the design changes from the standard commercial models to meet the Military Characteristics in detail and translating this data in accordance with NME performance rules. Performance data was supplied by the Air Force pilots as check points on the manufacturers claims. The reports from the various inspection and evaluating teams were then individually compiled and various weights of importance given to each item. It is here that the competition is won or lost since the relative importance of an almost endless number of design features are considered.

It would be impossible for any contestant to predict his standing without knowing the relative importance the Air Force gives these factors. For example, how much more valuable is a metal structure over a fabric-covered one? What is the service value of cadmium-plated steel parts over painted ones?

The importance of all these myriad technical questions are then weighed against production considerations. Can the winner build the plane—how fast—does he have the tooling—the manpower—such questions affect the final decision just as technical factors do. At any event, all these questions are then tossed into the hopper—the crank turned—and the final answer pops out. That's how the Air Force picks an off-the-shelf airplane. In this case it was the *Beaver*.

At the conclusion of the Air Force evaluation, all planes were invited to Ft. Bragg for an informal evaluation by the ground forces. The *Beaver* and *Aero Commander* were joined by Beech's *Twin Bonanza* which, however, unfortunately cracked-up in a landing demonstration.

The *Beaver* obviously met most of the published requirements for a heavy liaison plane as set out in the Military Characteristics. It's strictly a postwar airplane in spite of its similarity to the pre-war and wartime Norduyn *Norseman* and is one of the very few airplanes specifically designed for, and even by, those who buy and fly them. De Havilland, who has been building the British *Fox Moth* before the war for the legendary bush flyers of the Northern wilds, had in mind a high wing all-metal monoplane to replace the *Fox Moths* and *Norsemans*. As was done in the States after the War, they mailed out hundreds of questionnaires to the bush pilots asking what they wanted the postwar airplane to be. From these questionnaires the *Beaver* was born. The Chief Designer, Mr. W. J. Jakimiuk, a war refugee from the Polish aircraft works at P.Z.L., did an outstanding job compromising the various conflicting features asked for by pilots who have to service their planes standing on a float moored to a jutting tree on the bank of a lake in the wilderness. As a result of the many added features, and since the Gipsy Queen's weren't available, the famous Pratt & Whitney 450 hp. Wasp Jr., Model R-985-AN-6B, was used instead. Thousands of such engines are available as war surplus from the North American AT-6 (now the T-6) "Texan" program—or what the Canadians and British call "Harvards"—and what are now called "Mosquitos" in Korea where they are used as spotters.

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